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MACKENZIE VALLEY PIPELINE INQUIRY

Government
Publications

IN THE MATTER OF AN APPLICATION BY CANADIAN ARCTIC GAS
PIPELINE LIMITED FOR A RIGHT-OF-WAY THAT MIGHT BE
GRANTED ACROSS CROWN LANDS WITHIN THE YUKON TERRITORY
AND THE NORTHWEST TERRITORIES FOR THE PURPOSE OF THE
PROPOSED MACKENZIE VALLEY PIPELINE

and

IN THE MATTER OF THE SOCIAL, ENVIRONMENTAL AND ECONOMIC
IMPACT REGIONALLY OF THE CONSTRUCTION, OPERATION AND
SUBSEQUENT ABANDONMENT OF THE ABOVE PROPOSED PIPELINE

(Before the Honourable Mr. Justice Berger, Commissioner)

Yellowknife, N.W.T.

May 14, 1975.

PROCEEDINGS AT INQUIRY

VOLUME XXXVIII

CANADIAN ARCTIC
GAS STUDY LTD.

MAY 20 1975

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APPEARANCES:

Mr. Ian G. Scott, Q.C.	
Mr. Stephen T. Goudge,	
Mr. Alick Ryder and	
Mr. Ian Roland	for Mackenzie Valley Pipeline Inquiry
Mr. Pierre Genest, Q.C.	
Mr. Jack Marshall,	
Mr. Darryl Carter, and	
Mr. John Steeves	for Canadian Arctic Gas Pipeline Limited
Mr. Reginald Gibbs, Q.C.	
Mr. Alan Hollingworth	for Foothills Pipe Lines Ltd
Mr. Russell Anthony,	
Prof Alastair Lucas	for Canadian Arctic Resources Committee
Mr. Glen W. Bell and	
Mr. Gerry Sutton	for Northwest Territories Indian Brotherhood and Metis Association of the Northwest Territories
Mr. John U. Bayly	for Inuit Tapirisat of Canada and the Committee for Original Peoples' Entitlement
Mr. Ron Veale and	
Mr. Allen Lueck	for Council for Yukon Indians
Mr. Carson H. Templeton	for Environment Protection Board
Mr. David Reesor	for Northwest Territories Association of Municipalities
Mr. Murray Sigler	for Northwest Territories Chamber of Commerce

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I N D E X

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WITNESSES FOR APPLICANT:

Philip Harvey DAU

John Richard O'ROURKE

Guy Leslie WILLIAMS

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Dau, O'Rourke, Williams
Cross-Exam by Bayly

Yellowknife, N.W.T.

May 14, 1975.

(PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)

MR. SCOTT: Mr. Commissioner,

I am well aware of the practice that we've established, of submitting corrections to the reporters for inclusion in the Monday transcript of each week. However, there should be some exceptions to that, and it's been brought to my attention that there is an error in yesterday's transcript. In my statement at the opening it speaks of "Federal Civil Servants who have succumbed to the Inquiry."

(LAUGHTER)

That may reflect the thought; it doesn't reflect the accuracy of the -- it doesn't reflect the remarks. The word, of course, is seconded to the Inquiry. I'd appreciate it if that correction could be made by the reporters.

PHILIP HARVEY DAU,
JOHN RICHARD O'ROURKE,
GUY LESLIE WILLIAMS, resumed:

CROSS-EXAMINATION BY MR. BAYLY (CONTINUED):

Q Mr. Dau, when we left off yesterday we were discussing aerial seeding, and Mr. Genest has said that he will be producing a panel on this and I won't go into the mechanics of aerial seeding; but as it relates to the procedures in the construction of the proposed pipeline, could you answer the following question: Would seeding be done

Dau, O'Rourke, Williams
Cross-Exam by Bayly

1 on winter roads as well as on the right-of-way, to
2 your knowledge? Is that anticipated?

3 WITNESS DAU: Yes, it would be.

4 Q And the experiment that
5 was done was of seeding on winter roads rather than
6 on anything else; is that correct?

7 A It was on a winter road
8 and also on a well site, as I recall.

9 Q Now, moving over to you,
10 Mr. Williams, and I'm going to be talking about snow
11 roads, could you tell us about the reduction in ground
12 cover after a snow road has been built? I'm referring
13 to a document on which you rely, No. 462, called:

14 "Inuvik Snow Road Environmental Assessment,
15 Reference Report, June 27, 1974."

16 I have a copy of that.

17 WITNESS WILLIAMS: I have a
18 copy, sir.

19 Q Have you? I'm referring
20 to page 7 of that report under 3.1, "Vegetation", and
21 if I might just read this paragraph and ask you to
22 comment afterwards:

23 "Taken over all transects, the mean reduction
24 in ground cover due to snow road construction
25 and use was 45%."

26 Table 1.

27 "Plants most severely affected by the snow
28 roads were the evergreen shrubs (ground cover
29 reduction of 75%), followed by the deciduous
30 shrubs and the herbs with 69 and 67% ground

Dau, O'Rourke, Williams
Cross-Exam by Bayly

1 reduction respectively."

2 Plate 2.

3 "The lichens and mosses were left severely
4 affected, showing ground cover reduction of
5 43 and 25% respectively."

6 Now, is it fair to interpret
7 that paragraph as meaning that the plants that stand
8 up higher above the ground were more severely affected
9 than the ones that are low to the ground?

10 A I would say so, yes.

11 Q And would it be fair to
12 say that plants that were low to the ground may have
13 been protected by the plants that were higher up?

14 A During their natural
15 growing processes, are we speaking of, or during
16 construction?

17 Q I was thinking of during
18 the construction and use of the snow road, that they
19 provided a cover to protect, in other words the ever-
20 green shrubs stood up perhaps a foot or two, would
21 have provided a protection for the lichens and mosses
22 which are pretty close to ground level.

23 A I wouldn't expect that,
24 Mr. Bayly, but I can't say with certainty.

25 Q All right. Were any of
26 your experiments done in areas where there was no
27 higher ground cover? In other words, where there were
28 only lichens, mosses and perhaps some scrub willow?

29 A This is actual snow road
30 construction research work in more northern barren

Dau, O'Rourke, Williams
Cross-Exam by Bayly

1 areas?

2 Q Yes.

3 A Not by Northern Engineering,
4 no. We did observe work done by others in Alaska and
5 on Richards Island, for instance.

6 Q Did you observe it at the
7 winter stage or did you observe the results after the
8 snow had gone?

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1 A More in the construction
2 stage, I am sure that our botanists have looked at
3 the resulting disturbances following the summer. I have
4 not.

5 Q Now, the damage that
6 is referred to in this report appears to be damage above
7 the surface of the ground, that is to the part that
8 you can see without digging into whatever soil there is.
9 Have you been able to update what is in this report
10 with observations of whether this species under the
11 snow road have recovered some of the destruction referred
12 to in the paragraph I have read?

13 A No, this report, Mr.
14 Bayly, is dated December '74 and that was based on
15 observations last summer and last fall.

16 Q So we would have to wait
17 to this summer to be able to tell whether the
18 recovery had changed since a full season had passed
19 after that report.

20 A That is certainly planned,
21 yes, to keep monitoring that test site.

22 Q So there is no way of telling
23 at this point whether the defoliated species put out
24 new growth as was anticipated in this report?

25 A No, but I think that
26 the report goes on to say -- to observe that the
27 change in the active layer thickness, at least in the
28 first summer following construction was not
29 appreciably greater than that in the adjacent undis-
30 turbed area.

Dau, O'Rourke, Williams
Cross-Exam by Bayly

1 Q Now that is the soil rather
2 than the species, that is that the active layer
3 depth did not change appreciably and more than a centimeter
4 or two in the area where the snow road was constructed,
5 is that correct?

6 A That is correct and I
7 would think that is probably one of our main concerns.

8 Q Well, was any test made
9 on the compression of the soils in the active layer as
10 a result of the construction of the snow road?

11 A I do not think so.

12 Q I notice that in the report
13 it suggests that the average depression caused by
14 the snow road is one centimeter or a little more depending
15 on where you took your readings, is that correct, an
16 average around one centimeter?

17 A I think that is correct,
18 yes.

19 Q But nothing was done on the
20 compression of the --

21 A Measuring the compression
22 of the underlying soil in the active layer, no, sir,
23 that was not done.

24 Q All right.

25 Has anything been done to measure
26 the effect of the burning of the brush piles that we
27 saw in your slide and its affect on the vegetation and
28 revegetating?

29 A Are we still talking
30 about the Inuvik soil ?

1 Q We are talking about the INuvik
2 test site, I believe there were some brush piles you had
3 shown piled beside the snow road which you said would
4 be burned.

5 A No, I think I said it
6 would be put through a chipper at a later date,
7 Mr. Bayly, now there may have been one or two piles
8 burned for experimental purposes, but mostly the
9 brush cover was put through a chipper, a chipping
10 machine.

11 Q All right. Now, I
12 am wondering, Mr. Commissioner, I realize that this
13 experiment is still an ongoing one if Arctic Gas is
14 intending to produce results after or during the summer
15 of what has happened in this Inuvik snow road and
16 if we will have the benefit of those perhaps in the
17 biological phases of the hearings.

18 MR.MARSHALL: I will have to
19 get that information and let my learned friend know,
20 I do not know what the answer is.

21 MR. BAYLY: Now, moving on, Mr.
22 Williams, to the harvesting of snow from lakes or
23 rivers, now we saw in the snow road project that you
24 had some heavy equipment that you were using to do
25 the harvesting. Would you contemplate using that
26 kind of equipment for harvesting the snow or are
27 special machines going to be used or designed for this
28 purpose?

29 A Well, similar equipment to
30 that, Mr. Bayly, with the addition of Peter's snow miller

Dau, O'Rourke, Williams
Cross-Exam by Bayly

1 to load the snow onto trucks, it intensifies, it in-
2 creases the density of the snow and so it is a more
3 economic haul process, there would be that kind of
4 equipment. Sleigh-tract equipment would be used,
5 soft tract equipment for early snow road construction
6 processes.

7 Q Now, I am concerned
8 about snow harvesting on the north slope of the
9 Yukon and I am wondering whether it has been contemplated
10 that you will be harvesting snow from the sea ice.

11 A that was not included in
12 our plans, Mr. Bayly, on the coastal plain we plan the
13 use of snow fencing mainly -- as the main means of
14 accumulating snow. Conceivably around the stockpile sites
15 if snow was required that had not been provided for
16 by snow fencing I guess that this is a possibility
17 but we do not -- it is not in our plans or would I see
18 it used extensively of harvesting snow from sea ice.

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Dau, O'Rourke, Williams
Cross-Exam by Bayly

1 Q And I take it it will be
2 necessary to use the snow fences because there aren't a
3 large number of significantly large lakes on the North
4 Slope from which you could just harvest it the way you
5 did for the Inuvik snow road project?

6 A Well, I think the snow
7 fencing concept is considerably more economic than
8 harvesting from lakes, Mr. Bayly, and the Yukon Coastal
9 Plain lends itself to this type of snow accumulation.

10 Q Now, if I have it
11 correctly then, you would put up a snow fence to gather
12 the snow, and then you would gather it right off the
13 land, would you?

14 A The snow fences would be
15 on or close to the right-of-way and would almost be
16 used in place.

17 Q In other words, you would
18 place the snow fence to the windward side of the right-
19 of-way and the snow would gather right on it, and you
20 would compact it right where it was.

21 A Generally, yes.

22 Q And you feel that would
23 give you sufficient snow, perhaps supplemented with
24 snow-making machines?

25 A Yes, and conceivably
26 on some occasions hauling snow too, but I just mention
27 that our main means of accumulating snow on the Coastal
28 Plain would be by snow fence, but all three possibilities
29 still exist in that area, yes.

30 Q All right now, if you

Dau, O'Rourke, Williams
Cross-Exam by Bayly

1 were hauling snow, would you have to build permanent
2 roads to haul the snow on, or would you haul them
3 along the snow road, or build another snow road to
4 haul them on?

5 A It would be necessary to
6 have the proper equipment at the proper location in
7 -- at the beginning of the construction season where
8 water would be -- the equipment would have to be near
9 a source of water.

10 Q So would it have to be
11 dropped by airplanes or helicopters, or how would it
12 get there to the appropriate place?

13 A It would come by barge
14 in the summer months, the summer months maybe a year
15 ahead, and move in the winter to the appropriate
16 location.

17 Q Now I take it that along
18 the coast you probably will require some snow-making
19 equipment in terms of machines for manufacturing
20 snow, is that correct?

21 A It would certainly be
22 the plan to have them available if they were required,
23 yes sir.

24 Q Now is it contemplated
25 that all the water for the creation of this snow would
26 come from the rivers and lakes, or would some of it
27 come from the Beaufort Sea?

28 A No, I wouldn't see
29 using salt water for snow-manufacturing.

30 Q Now when you say you

Dau, O'Rourke, Williams
Cross-Exam by Bayly

1 wouldn't see, does that mean that it's out of the
2 question or is it something that just hasn't been
3 considered?

4 A It really hasn't been
5 seriously considered.

6 Q So as to any impact of
7 leaving salt deposits on the land is concerned, you
8 would have no experimental information on that?

9 A No sir.

10 Q Now, is it true that
11 the track vehicles have a more destructive effect on
12 snow roads than rubber-tired vehicles? Are they harder
13 on the snow roads than rubber-tired vehicles?

14 A Oh, it partly depends
15 on how the vehicles are loaded. I think normally you
16 can get a smaller unit pressure loading with a track
17 vehicle. On the other hand, the cleats on the vehicle
18 would have a disturbing effect as would chains on
19 wheeled vehicles. I would guess generally that track
20 equipment on a snow road would maybe be slightly more
21 harmful, but it's more to the surface rather than
22 getting deep holes in the road because of the heavier
23 bearing pressure per square inch. It's hard to
24 generalize, I think, Mr. Bayly.

25 Q All right. Now, in
26 your experiment we saw the photographs of trucks that
27 you had said had done a large number of passes on the
28 snow road. Did you do a large number of passes on the
29 snow road with track equipment as well, or was it
30 really restricted to rubber tired equipment?

Dau, O'Rourke, Williams
Cross-Exam by Bayly

1 A It was pretty well
2 restricted to rubber tired equipment.

3 Q Is it contemplated that
4 you will do similar experiments with track equipment
5 to see how the roads do stand up to continuous use
6 by that sort of machinery?

7 A Not really, Mr. Bayly,
8 because we have shown in other view graphs that the
9 full width of the right-of-way will have some protec-
10 tive snow cover, and not to the same extent as the
11 snow road itself but track vehicles are usually slow-
12 moving equipment that can progress over rougher terrain,
13 and probably they would travel off the snow road.
14 Certainly the construction equipment, the side booms
15 and other pipe-laying equipment would not be running
16 on the snow road, they would be on the working surface
17 of the right-of-way.

18 Q So if I understand it
19 then, there is part of the right-of-way that will not
20 be snow road, and upon that, that will be close to the
21 trench, I take it.

22 A The working area, yes.

23 Q And that won't have a
24 snow road pad and that's where the track vehicles --
25 the side booms etc. -- will be doing their work.

26 A That area will have a
27 protective snow cover but it will not be as deep or
28 as thick or as well-finished as the adjacent 30-foot
29 wide snow road, which is on one side of the right-of-
30 way.

Dau, O'Rourke, Williams
Cross-Exam by Bayly

1 Q Will it, in your opinion,
2 be as protective?

3 A Yes sir.

4 Q Now, would it be built
5 under the same methods of putting the snow down and
6 compacting it, or will some other technique be used?

7 A Well, in a normal year,
8 Mr. Bayly, we think that the natural snowfall compacted
9 on the working area of the right-of-way will be suffi-
10 cient to provide protection to the vegetative cover.

11 Q You don't contemplate
12 that this will cause a depression very close to where
13 the pipe will be buried?

14 A This has not been our
15 experience, no.

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Dau, O'Rourke, Williams
Cross-Exam by Bayly

1 This is roughly what was done
2 at San Sault over several thousand feet of line, or
3 a couple of thousand anyway, but the heavy equipment
4 worked on the right-of-way on compacted snow and
5 without serious detrimental effects.

6 Q Now, this I gather, though
7 has not been tried in the tundra areas of the north
8 slope, is that correct?

9 A That is correct, except
10 the tractors that are used to move rigs and whatnot,
11 Mr. Bayly, the snow roads that they use are certainly
12 not to the standard that we plan for hauling
13 pipe along the right-of-way.

14 Q And what has been the
15 experience with them, Mr. Williams, have they left
16 depressions or have they not?

17 A From what I have seen,
18 if it is done carefully, there is very little
19 depression left.

20 Q Now, when you say if it
21 is done carefully does that imply that each operator
22 has to be specially trained to be careful in the
23 techniques to avoid this kind of damage?

24 A He certainly needs some
25 instruction, yes, and some watching, probably.

26 Q Would it be possible
27 to build a snow road to insure that you did not get these
28 depressions right on the working surface or is that
29 out of the question?

30 A Well, I think that the

Dau, O'Rourke, Williams
Cross-Exam by Bayly

1 | depressions are generally caused when the tractor
2 | blade gets down and knocks the vegetation off. The
3 | vegetative cover, Mr. Bayly, and this is where the
4 | problem starts and we would plan to do all we could
5 | to avoid that.

6 | Q All right, how would this
7 | affect your response number 25 to the concerns expressed
8 | by the Government which deal with snow roads. I
9 | believe that you have a copy of the responses. The
10 | last page of 25, the sub-paragraph D and I will read
11 | it to you, Mr. Williams.

12 | "With the application of additional snow to
13 | the right-of-way the delayed construction
14 | seasons could be extended longer than
15 | that shown in the application schedules
16 | if allowed by other environmental con-
17 | siderations. This was shown to be possible
18 | during the Inuvik snow road test when
19 | heavy traffic was possible after May 6, 1974."

20 | The fact that you had not contemplated building a
21 | snow road in the working area, would that affect
22 | the response that has been made to question 25?

23 | A No, I do not see any
24 | problem.

25 | Q Do you know what I mean,
26 | that the snow might disappear off the working area before
27 | your snow road was unusable and damage might be done
28 | although the snow road area was perfectly sound?

29 | A Yes, the thinner the
30 | snow thickness, certainly the quicker it will leave,

Dau, O'Rourke, Williams
Cross-Exam by Bayly

1 but not by many -- I would not think by many days,
2 Mr. Bayly.

3 Q Well, Mr. Williams, who
4 is going to decide when that point has been reached and
5 how will that decision be made from the point of view
6 of engineering expertise?

7 A As to when construction
8 must cease because --

9 Q Because damage could
10 be done to the working surface.

11 A -- damage may be done --
12 I would think the owner that he is vitally concerned
13 that the right-of-way is not damaged to any extent
14 because he is going to be paying for maintenance cost
15 for now on unless things are done carefully and it is
16 in his interests to assure that the proper procedures
17 are carried out.

18 Q I agree with you there,
19 Mr. Williams, what I am wondering is does he turn to
20 a man like Mr. Williams and say, how deep is deep enough
21 or when should we stop. What sort of criteria have
22 you developed through your snow road experiments for
23 saying that is it, you should stop today?

24 A Well, he should stop
25 before the equipment starts to cut in and disturb the
26 vegetative cover.

27 Q All right, so you would have
28 to have one of your monitors, would you, checking out
29 to make sure that the vegetative cover was not
30 disturbed by the movement of the equipment, would that

Dau, O'Rourke, Williams
Cross-Exam by Bayly

1 be fair to say?

2 A I would think that is
3 fair, yes.

4 Q All right. You showed
5 on the slide that in some cases where the snow road
6 was damaged a binding medium was used and the medium
7 that was used in the photograph, I believe was sawdust
8 and I think there was something else in it but it
9 was basically sawdust, is that correct?

10 A Sawdust, snow and water,
11 I think so, yes.

12 Q Now, what happens to
13 that at the end of the snow road?

14 A Well, the first thing
15 that we observed at Inuvik is that the sawdust acted
16 as an insulator and it -- the snow thawed less quickly
17 than in adjacent spots, but it did thaw certainly
18 eventually and this is a minor amount of sawdust really
19 that did not effect the growth that was left on
20 the right-of-way.

21 Q I assume from that answer
22 and correct me if I am wrong that the sawdust, it is
23 contemplated would remain?

24 A Yes, sir.

25 Q All right, now are any
26 other binding mediums contemplated to be used other
27 than sawdust?

28 A Oh, in some areas where
29 we have -- might have wood chips, that is a possibility,
30 otherwise it would be, repairs would be mainly made with

Dau, O'Rourke, Williams
Cross-Exam by Bayly

1 snow and water.

2 Q And would the wood chips,
3 would you contemplate that they would remain too or
4 would somebody come to pick them up afterwards?

5 A No, I would contemplate
6 that they would remain there. We are talking about
7 a very thin layer now, Mr. Bayly, not a great depth
8 of material.

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Dau, O'Rourke, Williams
Cross-Exam by Bayly

1 Q Are you contemplating
2 the use of any chemical binders for the snow?

3 A No sir.

4 Q Now, when you did your
5 experiment and took the snow from that lake whose
6 name I can't remember --

7 A Dolomite Lake.

8 Q -- Dolomite Lake, to
9 the experimental snow road, can you tell me how deep
10 that lake was?

11 A No, I don't have that
12 number. We probably have it in Calgary. I think I
13 talked about 18 to 22 inches of ice when the work was
14 being done. No, I'm sorry, I don't have that.

15 Q All right now, before you
16 started to harvest the ice from that lake did you
17 measure the depth of that lake?

18 A I'm certain that was
19 done, yes. I wasn't there personally at the time
20 but for safety reasons I'm sure that would have been
21 done.

22 Q All right, I'm suggest-
23 ing to you that there is a critical depth of lakes
24 discussed in one of your reports. It's document 18
25 called:

26 "Effects of Snow Removal from Ice-Covered Lakes,
27 Preliminary Report."

28 Are you familiar with that document, sir?

29 A Yes sir.

30 Q And I believe it is suggested

Dau, O' Rourke, Williams
Cross-Exam by Bayly

1 in that document on page 2 about the middle of the page
2 under (a):

3 "Wherever possible, snow should be removed from
4 areas that would have no free water in any case,
5 i.e. in shallow areas where water is less than
6 two meters in depth."

7 Are you aware of whether or not Dolomite Lake was
8 less than two meters in depth?

9 A No sir, I'm not.

10 Q All right, and I under-
11 stand the reason for that is those are lakes that it
12 is contemplated would freeze to the bottom anyway.

13 A Yes sir.

14 Q And that if you take
15 water, sorry, you take snow from the ice on lakes
16 that are deeper, they may freeze deeper than usual and
17 if any aquatic life is under the ice it may affect it,
18 is that correct?

19 A Yes sir.

20 Q Would it be contemplated
21 that it would be the procedure of Arctic Gas and its
22 contractors to measure the depth prior to the removal
23 from any body of water?

24 A I think that would be
25 done even ahead of that, Mr. Bayly, to set out lakes
26 that do not support fish, for instance, ponds and
27 what-not, and these would be designated as potential
28 snow borrow sites.

29 Q Was any follow-up testing
30 done on Dolomite Lake to see whether the ice was thicker

Dau, O'Rourke, Williams
Cross-Exam by Bayly

1 that year than usual because of the removal of the
2 snow?

3 A I don't think so.

4 Q Now, is it not true that
5 in some snow road construction that the brush that is
6 cut from the right-of-way is piled back onto it to
7 give an added protection underneath the snow that is
8 compacted on the snow road?

9 A I'm not sure if I've
10 heard of that technique or not. I may have read about
11 it. We did not try it, Mr. Bayly.

12 Q All right. Now when you
13 say, "We did not try it," has it ever been tried in
14 experiments to see whether it works as well, or not
15 as well as the method that you use?

16 A Well, we didn't, Mr.
17 Bayly. We piled brush in the middle of clearings where a
18 permanent road was to be constructed, but we didn't
19 try it with the snow road.

20 Q All right, is it con-
21 templated that you will be trying that prior to
22 coming/^{up}with a final design for snow roads?

23 A I'm sorry, we really
24 haven't thought about it. I wouldn't think so, but
25 I'm not certain.

26 Q All right. Referring
27 again to this report No. 18, on the first page it
28 referred to a literature survey. I was unable to find
29 in Arctic Gas' library any follow-up report that
30 suggested whether the literature survey had been

Dau, O'Rourke, Williams
Cross-Exam by Bayly
Cross-Exam by Lucas

1 carried out. I'll read the paragraph:

2 "A literature survey will be carried out to
3 examine in detail possible effects of snow
4 removal from ice-covered lakes on the North
5 Slope."

6 That's the first sentence of that report.

7 A No sir, I'm not sure
8 if that has been done.

9 MR. BAYLY: All right, I'm
10 wondering, Mr. Commissioner, if counsel for Arctic
11 Gas could make us aware of whether or not that has
12 been done and if it's available?

13 MR. MARSHALL: We'll check
14 that, sir.

15 MR. BAYLY: Those are all the
16 questions I have. Thank you, sir.

17
18 CROSS-EXAMINATION BY MR. LUCAS:

19 Q Now, Mr. Dau, referring
20 first to construction resources and specifically to
21 borrow requirements for this purpose, it has been
22 stated, I believe, in previous direct testimony and it's
23 also indicated on the route maps filed as part of the
24 Section 13-A construction plan:

25 "Preferred and alternate borrow sources are
26 indicated"

27 on those route maps. Now, what I would like to know
28 is whether at this stage final decisions have been
29 made with respect to those preferred and alternate
30 borrow sources?

Dau, O'Rourke, Williams
Cross-Exam by Lucas

WITNESS DAU:

1 A No, they have not.

2 Q When are these decisions
3 likely to be made?

4 A Before the decision can
5 be made we'll have to -- or there will have to be fur-
6 ther investigations on many of the potential borrow
7 sites. These would be drilling programs to determine
8 exactly what's there.

9 Q Will the final decisions
10 be made then, just prior to construction?

11 A No, they would probably
12 be made at least a year ahead of development of a
13 particular site.

14 Q Would you expect in some
15 cases, though, that decisions would in fact be made
16 at a later stage, perhaps even during construction?

17 A I'm sure that will occur,
18 sir.

19 Q And with respect to
20 quantities of borrow material to be taken from
21 particular sources, would the same be true, that is
22 decisions may be made actually during construction?

23 A That would be a rare
24 case, but again I'm positive that that will happen,
25 that we ^{would} attempt to determine that well in advance and
26 there probably will be changes.

27 Q But it may --

28 A It will be rare.

29 Q I'm sorry, Mr. Dau.

30 A Yes, go ahead.

Dau, O'Rourke, Williams
Cross-Exam by Lucas

1 Q It may in fact be
2 necessary to take more material from a particular
3 borrow source than was originally anticipated?

4 A That could happen, yes.

5 Q Turning to the prepared
6 direct testimony at page 20, it is stated that where
7 fill is encountered of a size and shape that may damage
8 the pipe, select padding material consisting of pro-
9 cessed spoil material or borrow around the pipe to a
10 minimum thickness of six inches may be used. Now,
11 is it possible, Mr. Dau, at this stage to identify
12 the sections of the pipe in which this select padding
13 material may be necessary?

14 A Certainly any area
15 that's in solid rock which requires blasting would
16 be an area that the select material would be required.

17 Q But you couldn't tell us
18 specific quantities with respect to particular spots
19 along the line at this stage?

20 A No sir.

21 Q And in fact in many
22 cases you wouldn't know that until construction was
23 in progress.

24 A That's correct.

25 Q It's indicated here also
26 that some kind of processing will be necessary for
27 this select padding material. What would this involve?

28 A It would be a crushing
29 operation.

30 Q And can you tell us

Dau, O'Rourke, Williams
Cross-Exam by Lucas

1 now where these crushing operations will take place?

2 A I'm pretty sure they
3 would take place in the borrow site area, in the
4 borrow site itself.

5 Q But you haven't made
6 final decisions as to the borrow sites.

7 A No sir.

8 Q So you couldn't tell us
9 specifically where the crushing will take place.

10 A Not specifically, sir.

11 Q Will washing be involved?

12 A No sir.

13 Q Again, Mr. Dau, at page
14 20 of the prepared direct testimony, a little further
15 down the page, if the native backfill is found to be
16 unsuitable, select borrow will be placed and the
17 native backfill will be disposed of at appropriate
18 locations. I'm quoting from page 20, and then there
19 follows a list of purposes for which this select
20 borrow may be used.

21 Now, can you identify the
22 locations along the route at which select borrow may
23 be required at this stage?

24 A We've indicated in a
25 general way where it may be required, but that's
26 really a matter of the final design stage and we've
27 not progressed that far. For instance, we've indi-
28 cated the preliminary designs for drainage, erosion
29 control measures; we've indicated the general area
30 of potential frost-heaving and things like that, but

Dau, O'Rourke, Williams
Cross-Exam by Lucas

1 we can't give you specific numbers, no.

2 Q You can't be specific as
3 to sites at this stage?

4 A That's correct, sir.

5 Q And in fact some of the
6 specific sites may not actually be known until construc-
7 tion is in progress.

8 A That's correct.

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1 Q And similarly with
2 respect to quantities?

3 A We would have a pretty
4 good feel for it before construction actually got
5 in process, but there is no question that there will
6 be cases that will be discovered at the time of
7 excavating the trench, for instance. We will know
8 prior to construction where many of them, many of
9 these areas are, but there is no question that there
10 will be some that will be determined during construction.

11 Q I refer you, Mr. Dau,
12 to section 13A of the application, section 6.5.9, page
13 46 -- I will need a few minutes myself -- Bouyancy
14 control,

15 A Yes.

16 Q It is stated that a
17 preliminary determination of areas that may require bouyan-
18 cy control is shown on the alignment sheets contained in
19 section 8A 3. Final location of areas requiring
20 bouyancy control measures will be determined on the
21 basis of surveys, sub-surface investigations and
22 visual assessments of inspection staff up to the time
23 of installation.

24 Now, at this stage are you
25 able to indicate to us with any degree of particularity
26 where bouyancy control measures as indicated in the
27 application will be required?

28 A The alignment sheets show
29 or indicate areas where we feel that bouyancy control
30 measures are required in a particular section, now that

Dau, O'Rourke, Williams
Cross-Exam by Lucas.

1 determination has been based on the reconnaissance
2 trips that have been made, the interpretation of
3 aerial photography and the data that was obtained from
4 soil boring programs if applicable in that particular
5 area. They also indicate where, in another classification,
6 areas that, or a section in which there will be some
7 bouyancy control measures required in the section, not
8 continuous, but within the section. And that, of
9 course, is still based on the same information of
10 reconnaissance, air photo interpretation and so on.

11 Q So you are referring to
12 the B1 and B2 designations on your alignment sheets?

13 A Yes.

14 Q But, well, referring
15 specifically to the B2 designated areas, what you
16 are saying is that bouyancy control measures will be
17 required in those areas identified, but you are not
18 saying specifically where bouyancy control measures
19 will be required along the line?

20 A that is right.

21 Q And you cannot -- also
22 you cannot tell us at this stage specifically what
23 type of bouyancy control measure will be required
24 at any particular spot.

25 A Not in those sections,
26 no.

27 Q Is it possible, Mr.
28 Dau that the nature and location of bouyancy control
29 measures in many sections of the line in fact will not
30 be known until during construction?

Dau, O'Rourke, Williams
Cross-Exam by Lucas

1 A In some sections of the
2 line, I would not say many. I think most of the
3 areas in which bouyancy control is required will be
4 determined during the survey phase when someone is
5 actually on the ground and visually has seen the
6 terrain, at that stage there would be some field
7 investigations on boring programs, drilling programs
8 and most of the areas will be determined at that
9 time, but there will be some areas that undoubtedly
10 will be determined at the time of construction and
11 you open a trench.

12 Q And those decisions then
13 would be essentially field decisions made while construction
14 is in progress?

15 A Yes.

16 Q Also with respect to
17 bouyancy control, Mr. Dau, it has been stated in the
18 application that the weights used for bouyancy control
19 will be cast in the field, is that correct?

20 A Yes.

21 Q And that for this casting
22 process, good quality borrow material will be
23 required? Is that correct?

24 A REasonably good quality,
25 yes.

26 THE COMMISSIONER: I have
27 lost you there. You are making cement or making
28 concrete on the site, is that what you are driving
29 at here and you need gravel from borrow sites, or have
30 I misunderstood all of this.

Dau, O'Rourke, Williams
Cross-Exam by Lucas.

1 A Yes, we are talking about
2 a concrete operation in the area that you require the
3 weights so that you do not physically transport all the
4 aggregate from some distance --

5 Q Yes --

6 A -- when you want to transport
7 the cement.

8 Q The borrow material
9 will have to be processed.

10 A That borrow material would,
11 yes.

12 Q And what would the nature of
13 the processing be?

14 A It could involve, well,
15 it would depend on the particular borrow site. It
16 could involve some crushing and in that instance it
17 could involve some washing.

18 Q But you cannot tell us
19 at this stage precisely where those crushing and washing
20 operations will be carried out?

21 A No, I cannot.

22 Q And similarly you cannot
23 tell us the quantities of materials that may have to
24 be processed in that way?

25 A No, because obviously some
26 of the sites would be adequate with just straight pit-
27 run material.

28 Q Where washing is carried
29 out presumably the -- presumably water will be
30 required for the process.

1 A Yes.

2 Q And it will be required from
3 a source near the site of the operation?

4 A Yes.

5 Q So you cannot tell us at
6 this stage then precisely where those sites will be
7 where water will be drawn?

8 A Not at this stage, no.

9 Q And the operation, the
10 washing operation is likely to produce silt laden
11 water?

12 A Yes.

13 Q that has to be disposed of?

14 A Yes.

15 Q And you cannot tell us
16 where that silt laden water will disposed of at this
17 stage?

18 A I am sure that it would
19 go through some sort of a settling pond and to
20 remove as much of the silt as possible.

21 Q But you cannot tell us
22 where these settling ponds will be located?

23 A Not at this stage.

24 Q And you cannot tell
25 us where the treated effluent will be disposed of?

26 A No, I cannot.

27 Q These decisions then
28 with respect to processing sites and water sources,
29 treatment and disposal of the effluent, when will these
30 decisions be made then?

Dau, O'Rourke, Williams
Cross-Exam by Lucas

1 A They would be made at
2 a time frame, generally a year before the construction
3 operation. They would be -- the survey programs and the
4 drilling programs would gather the information that
5 was necessary to go into a final design as to --
6 to determine exactly what would be done. It is
7 necessary to make the decision at least a year prior
8 to operation so that you have an opportunity to
9 get the necessary equipment to the area and presumably
10 we are talking about the northern areas which would
11 have to go in by barge in the summer season.

12 Q So you say that the decision
13 would have to be made at least a year prior to the
14 operations in a particular area?

15 A That is right.

16 Q So in fact decisions with
17 respect to these matters could be made after construction
18 is in progress in other areas?

19 A Yes, that is possible, the
20 final decision of what might happen at a borrow site
21 for instance along the Arctic coast may be made, which
22 would be required in the third winter, that decision
23 may be made after construction operations have
24 started in some other area, yes.

Dau, O'Rourke, Williams
Cross-Exam by Lucas

Q Turning again to Section
13 A, Mr. Dau, Section 6.4.1 at page 32, the 1, 2, 3,
4, 5th paragraph under the "Ice-capped roads" heading,
it's stated here that:

"Water sources will be identified prior to
construction and will be assessed in terms
of environmental acceptability with particular
regard to avoidance of fish overwintering
areas."

Now, with respect to water requirements for snow
roads, both for possible ice-capping and for possible
use in artificial snow-making, at this point you cannot
identify precisely the sources from which this water
will be drawn along the route. Is that correct?

A With the exception that
we would obviously use the Mackenzie River where the
route was very close to the river.

Q But you can't tell us
where the withdrawals would be from the Mackenzie,
can you?

A No, not in specific
detail, no. No, I can't, sir.

Q When will the location
of these water sources be known? When can you tell us?

A That investigation of
the sources would be conducted generally during the
survey program, which again would be at least one
year prior to any construction in the area.

Q Is it possible, Mr.
Dau, that some decisions with respect to specific

Dau, O'Rourke, Williams
Cross-Exam by Lucas

1 water sources would be made during construction?

2 A No, I think they would
3 be made ahead of time.

4 Q Is it not inconceivable
5 that sources would be identified ahead of time that
6 would in fact turn out to be unusable during construc-
7 tion because of a lake freezing to the bottom, for
8 example?

9 A I guess that could happen.
10 I think the possibility is pretty remote.

11 Q But it is conceivable
12 that some of these decisions will have to be made in
13 the field.

14 A Yes, I'm sure that when
15 sources are selected, there will be alternatives
16 selected also.

17 Q And so far as quantities
18 from any particular source are concerned, you can't
19 tell us that right now.

20 A No, I cannot.

21 Q And in fact you're not
22 likely to know until the process of construction.

23 A For snow roads we
24 certainly wouldn't know until that time.

25 Q Turning over a couple
26 of pages in the Section 13 A, Mr. Dau, Section 6.5.1,
27 page 39 under the heading, "Arctic Construction," and
28 the last sentence in the first paragraph under that
29 heading. It states:

30 "The applicant is conducting further studies

Dau, O'Rourke, Williams
Cross-Exam by Lucas

1 that will assist in determining the practical
2 limitations of utilizing filling technique."

3 Now, what is the nature of these studies?

4 A Well, the Inuvik snow
5 road test is one.

6 Q Are there any others?

7 A No, I think not. None
8 are planned at the present moment, no sir.

9 Q What did the Inuvik
10 snow road tell you about the practical limitations
11 of filling techniques?

12 A Mr. Williams could
13 probably respond to this in more detail than I can.
14 It was constructed on a side slope and we did have,
15 as I remember, some depth of processed snow that were
16 in the order of 5 1/2 and 6 feet.

17 Q Would you care to comment,
18 Mr. Williams?

19 WITNESS WILLIAMS: The
20 Inuvik snow road, the side hill portion was construc-
21 ted on the slope of about 11%, and we found that this
22 was -- that a successful road could be achieved on
23 that kind of side slope, and also we know now that a
24 very small percentage of the line will be on a side
25 slope of that magnitude.

26 Q Returning to Mr. Dau
27 then, taking Mr. Williams' last remark that a very
28 small percentage of the line will be on a side slope
29 that would require filling, can you us precisely
30 where the areas are in which filling would be required?

Dau, O'Rourke, Williams
Cross-Exam by Lucas

1 WITNESS DAU: We have some
2 information on slopes, that is in work paper form that
3 gives the range of slopes along the route. It's not
4 marked on alignment sheets or anything like that, as
5 I understand it, and it's not -- it has not been
6 determined in the field. It's from aerial photography
7 and therefore has some sort of an accuracy to it. We
8 couldn't get specific and tell you exactly where we're
9 going to use them at this stage, no. It's a matter
10 of determining information from the field in the survey
11 phase.

12 Q That just tells you
13 where the slopes are, it doesn't tell you whether
14 they will have to be filled or not.

15 A That's correct. There
16 could be areas that -- where the air photo techniques
17 said, "This is an area of slopes of this range," but
18 in actual fact when you got in the field you may find
19 that it's quite level for a short distance.

20 Q So in fact many of these
21 decisions with respect to where particular filling
22 techniques will be used will be made in the field
23 during construction.

24 A Yes. Some will obviously.
25 Some will be made in the design phase from information
26 gathered in the field, but some will be made in the
27 field, yes.

28 Q Turning again to Section
29 13 A, 6.4.4 at page 34, under the heading, "Wharves",
30 the applicant states on page 34:

Dau, O'Rourke, Williams
Cross-Exam by Lucas

1 "A preliminary site selection has been made
2 for wharves. Final site selection and design
3 will be determined following further consultation
4 with the Department of Public Works and established
5 Mackenzie River barge operators. It is expected
6 that construction will utilize conventional
7 procedures."

8 Now, can you tell us at this stage where these wharves
9 will be located, that is have you made decisions as to
10 sites?

11 A In a general way; we have
12 not completed the detailed investigations in the
13 field to determine each specific location of a wharf.
14 That program requires some drilling and some soundings
15 in the river, and is currently planned for this summer.

16 Q And you have been consult-
17 ing the Department of Public Works and the Mackenzie
18 River barge operators.

19 A We have had discussions
20 with them, yes.

21 Q When can you tell us
22 precisely where these wharves will be located?

23 A In time it would be at
24 least a year away, I would think. The location will
25 be determined at least six months before any operation,
26 any construction operation at the site has been
27 begun. The field program I mentioned would determine
28 the exact location / in the design process, and obviously
29 the material to construct the wharf would have to be
30 taken down the river in barges during the summer

Dau, O'Rourke, Williams
Cross-Exam by Lucas

1 season. They would be constructed, I believe, almost
2 in every instance, during the summer.

3 Q So you'd like to know
4 certainly where the wharves are going to be located
5 before the barges get in the river.

6 A Yes, that would be the
7 process, design process.

8 Q It isn't likely in fact
9 that some decisions as to wharf locations and particular
10 sites will be made after construction is under way in
11 other areas?

12 A Construction --

13 Q On the pipeline.

14 A Pipeline instalation?

15 Q Yes.

16 A I would suspect that
17 all the sites would be located pretty -- all would
18 be located prior to any pipeline installation, I think
19 that would all be done prior to pipeline installa-
20 tion.

21 Q But is it conceivable
22 that things could happen to cause you to change your
23 mind, for example, about North Slope wharf locations
24 -- specific North Slope wharf locations after construc-
25 tion had begun on the delta-Caroline route?

26 A That could happen, sir,
27 yes.

28 Q In making these final
29 decisions with respect to wharf sites, Mr. Dau, is
30 the applicant relying in any way on the Department of

Dau, O'Rourke, Williams
Cross-Exam by Lucas

1 Public Works and the Mackenzie River barge operators?

2 A Certainly in the sense
3 that Mackenzie River barge operators have input
4 into the design of a wharf, he would have some pre-
5 ferred locations and his particular expertise is
6 required in getting the final location, and I'm sure
7 the Department of Public Works will be involved because
8 I believe they have to issue some permits to construct
9 these facilities.

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1 Q You are aware no doubt of
2 the dangers of protracted negotiations with departments
3 of the Government of Canada.

4 A Yes, I am, sir.

5 Q Mr. Dau, the applicant
6 has stated that temporary access roads to the pipeline
7 route will be required in certain locations. Now, are
8 you in a position now to tell us precisely where all
9 of these temporary roads will be located?

10 Some of them are marked --
11 I realize that some of them are marked on the
12 alignment sheets and on the route maps in section
13 13A --

14 A Yes, we have attempted
15 to show the location of the temporary access roads
16 that we can foresee at this time on the alignment
17 sheets and strip maps. I am pretty sure that during
18 the final design phase that there will be some changes
19 in those locations, detailed field investigation I am
20 sure would show that some of them should be moved
21 to some degree and in all probability there may be
22 more or less, but again those can only be determined
23 after an extensive program in the field.

24 Q So there may be changes in
25 the specific location of these temporary access roads
26 that are shown in the application?

27 A That is possible, sir, yes.

28 Q And in fact there may be
29 temporary access roads that are not shown in the
30 application?

Dau, O'Rourke, Williams
Cross-Exam by Lucas

1 A That could be.

2 Q And when are we going to
3 know about this?

4 A Again, it would be -
5 they would be determined about one year prior to any
6 construction.

7 Q Well, with respect, Mr. Dau,
8 to a particular access road, is it not possible that
9 the question of whether the road is going to follow
10 the ridge or follow the side slope may be a decision
11 that in fact would be made in the field during construc-
12 tion?

13 A No, I think, not during
14 construction. I would think that that decision would
15 be made well in advance of that.

16 Q So you would be able to
17 say well in advance of construction of each of these
18 temporary roads precisely where it is going to be
19 located, that is, the precise alignment.

20 A Yes.

21 Q And you could not conceive
22 of the possibility of changes having to be made at
23 the last minute in the field.

24 A Oh, yes, there can
25 be changes made. I cannot say that there would
26 never be a change made. It would depend on the
27 circumstances. I believe that the location of
28 the roads will be determined prior to construction.
29 They will be surveyed before construction, construction
30 of the road, and that determination will be made in

1 the design phase after we have gathered all of the
2 information from the survey and field investigation
3 programs.

4 Q some of these temporary
5 roads will be snow roads, is that correct?

6 A Yes.

7 Q Will they be surveyed
8 too?

9 A Yes, in that sense, yes,
10 they --

11 Q In section 13A at 3.2
12 page 12, this is under the heading Dempster Highway
13 on page 12, have you got it?

14 A Yes.

15 Q It states:

16 "The Department of Public Works has indicated
17 that it proposes to build a number of all
18 weather roads from designated locations on
19 the Mackenzie River to the Mackenzie High-
20 way route."

21 Now, can you identify the
22 location of these proposed D.P.W. all-weather access
23 roads at the moment?

24 A no, I cannot.

25 WITNESS O'ROURKE:

26 A I think that comment was
27 intended to cover short pieces of road at places
28 like Norman Wells, Fort Good Hope, perhaps Wrigley.
29 The existing communities on the river today who have
30 no need for a road connection from the river to a

Dau , O'Rourke, Williams
Cross-Exam by Lucas

1 highway that does not exist.

2 Q So these are relevant only
3 on the assumption that the Mackenzie Highway is extended
4 further?

5 A Yes, sir.

6 Q So presumably we do not know
7 their location.

8 Still in section 13a, 6.5.11 ,
9 I believe it is, at page 48, under the heading "River
10 Crossings", and I believe that this is also covered at
11 pages ²¹ 22 of your prepared testimony. It is indicated
12 on page 48 that sites for major river crossings north
13 of the 60th parallel have been located and examined and
14 preferred crossing techniques have been tentatively
15 selected, but that a final decision has not been
16 made as to crossing procedures and I am referring to
17 the techniques, A, B, and C that are set out in
18 this part of the application.

19 Now, Mr. Dau, have final
20 decisions been made as to the specific crossing
21 technique, A, B, or C to be used for the major
22 crossings, the ones that the applicant has referred
23 to as major crossings?

24 WITNESS DAU:

25 A Yes, I believe they
26 have some of the technique, A for instance I think
27 would certainly be utilized on the Mackenzie
28 River crossings.

29 Q On all three of the
30 Mackenzie River crossings, the Point Separation

1 crossing, the crossing at Fort Simpson and the Swimming
2 Point crossing? Technique A would be used
3 for all of those?

4 A I believe that is the
5 current thinking, sir. The one at -- the crossing
6 at Swimming Point may be an exception.

7 Q So there could be a change?

8 A Yes, those -- we have
9 not -- we are not in that particular stage of the
10 design as yet.

11 Q When are you going to
12 be?

13 A After we get the permit
14 to proceed, sir. It is a --

15 Q What kind of a permit,
16 Mr. Dau?

17 A get the necessary
18 regulatory approvals to proceed, the detailed design
19 phase is a very expensive operation, the applicant
20 I am sure is not going to spend that money prior to
21 obtaining regulatory approvals. We are in a preliminary
22 design stage at this time.

23 Q So we will not know
24 whether technique A which involves welding the pipe
25 into sections and then dragging it across basically,
26 technique B which involves the construction of
27 a berm, or technique C which apparently involves a
28 series of linked barges extending up from the bank. We
29 do not know whether any particular of those, any one
30 of those techniques will be used, for example for the

Dau, O'Rourke, Williams
Cross-Exam by Lucas

1 Swimming Point crossing?

2 A I am trying to recall,
3 sir. I think Swimming Point crossing is one
4 crossing that has a rather extensive shallow area
5 on one bank and that could be one of the crossings
6 where technique B would be used.

7 Q So you might construct
8 a berm?

9 A It could be, sir.

10 Q But you cannot tell us
11 now?

12 A I cannot tell you now.

13 Q And you cannot tell us
14 in fact until you receive your basic regulatory approvals?

15 A That would be my under-
16 standing. I am not -- it relates to the fact that
17 the design phase is a very expensive operation and in
18 my understanding the applicant is not willing to spend
19 that amount of money without some assurance of regulatory
20 approvals to construct the pipeline.

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Dau, O'Rourke, Williams
Cross-Exam by Lucas

1 Q Well, the same would be
2 true then of the Great Bear River crossing, you couldn't
3 tell us specifically what technique would be used to
4 cross the Great Bear?

5 THE COMMISSIONER: I thought
6 that on one of the panels Dr. Hollingshead, I believe
7 it was, indicated you might use technique B, but
8 he didn't say "B", but I thought on Great Bear you
9 might have a berm extending out into the river. Did
10 I --

11 WITNESS WILLIAMS:
12 A Yes sir, he did. He
13 suggested technique B for the Great Bear River crossing,
14 but I think Mr. Dau said, "This is not engraved in
15 stone and changes can be made." But that is the tech-
16 nique that is filed in the application for the Great
17 Bear crossing, technique B,

18 MR. LUCAS: So that's not a
19 final decision.

20 A No sir.

21 Q And changes could be
22 made?

23 A Yes sir.

24 Q And those changes could
25 in fact take place years from now.

26 MR. GENEST We hope not.

27 MR. LUCAS: Certainly after
28 regulatory approvals have been obtained.

29 A In Mr. Dau's opinion, yes.

30 Q Is that your opinion as
31 well?

Dau, O'Rourke, Williams
Cross-Exam by Lucas

1 A That is also my opinion,
2 yes sir.

3 THE COMMISSIONER: Mr. Lucas,
4 I don't know whether counsel have considered this, but
5 if Canadian Arctic Resources Committee or the Environ-
6 ment Protection Board, or Commission counsel, or
7 counsel for the natives had propositions to urge
8 regarding which technique, A, B, or C, would be
9 least detrimental to the environment at any major
10 river crossing, that could be urged and it could be
11 urged that it be incorporated as one of the terms and
12 conditions of the obtaining of a right-of-way. I'm
13 not saying -- I'm not asking anybody to do that, but
14 this thing in a sense may cut both ways. If Arctic
15 Gas says, "Well, we don't want to decide that now,"
16 it may be that you can urge it upon the Inquiry that
17 it ought to make that recommendation at each river
18 crossing. If you are in a position to make an
19 intelligent appraisal of the matter yourself and urge
20 a specific term or condition upon the Inquiry, I'm
21 not suggesting that anyone should respond to that now
22 but it might be borne in mind.

23 MR. LUCAS: Well, that will
24 certainly be kept in mind and the Canadian Arctic
25 Resources Committee does propose to present direct
26 testimony on -- in fact on many of the issues that
27 have been touched on, by the questions so far.

28 I have a couple more questions,
29 Mr. Dau, with respect to river crossings.

30 Q Referring again to the

Dau, O'Rourke, Williams
Cross-Exam by Lucas

1 three stated techniques, A, B, and C, have you received
2 any advice from your environmental consultants regarding
3 the likelihood of environmental damage that would be
4 caused by the use of either A, B, or C?

5 WITNESS DAU: Yes, these pro-
6 grams have been discussed with our consultants.

7 Q And have they indicated
8 to you that one or the other of these is the least
9 environmentally damaging?

10 WITNESS WILLIAMS: The one
11 that comes to mind, Mr. Lucas, is the Great Bear River,
12 and the feeling of our fish biologist -- biology group
13 in that case is that they would prefer not to see
14 procedure B used if it could be avoided. They would
15 prefer A or C. The other crossings, that similar
16 technique at Swimming Point, I don't recall that being
17 considered as a problem by the fish biologists.

18 Q Would it be fair to say,
19 Mr. Williams, that the technique about which the
20 environmental consultants have expressed the most
21 concern is B?

22 A Yes, I think that is fair.
23 That is a fair statement.

24 Q Have they given you
25 advice with respect to any of the other major river
26 crossings?

27 A Oh, we've certainly --
28 the other major river crossings, we've certainly gone
29 over the construction plans with them and the ones we
30 are talking about are mainly the Mackenzie and the Peel

Dau, O'Rourke, Williams
Cross-Exam by Lucas

1 except for the Great Bear, and the silt loads in those
2 rivers are normally very high, and the incremental
3 load caused by construction, regardless of procedure,
4 the general feeling that I got from our biologist
5 was that it wasn't a severe situation.

6 Q So they made no specific
7 recommendation with respect to choice of techniques
8 for the Peel and the Mackenzie crossings?

9 A No, I don't recall any
10 specific suggestion.

11 Q Did you ask them for
12 recommendations?

13 A That would be inherent
14 in the discussion that we had, yes.

15 Q There were simply
16 discussions, you didn't ask your consultants specifi-
17 cally for recommendations as to crossing techniques
18 -- as to preferred crossing techniques for the Peel
19 and for the Mackenzie River crossings?

20 A I don't think we asked
21 them to prepare a report, Mr. Lucas, but I'm sure
22 in discussions this type of question came up.

23 Q Well, just to summarize
24 for a moment, Mr. Dau, is it fair to say that many
25 of the decisions regarding construction resources,
26 including borrow materials, water sources, location
27 of facilities including weight casting, wharves,
28 temporary roads, and some of the specific construction
29 techniques, including the use of select padding,
30 buoyancy control, and snow fill, would it be fair to

Dau, O'Rourke, Williams
Cross-Exam by Lucas

1 say with respect to all of these decisions many of
2 them are likely to be made at a much later stage in
3 the design process?

WITNESS DAU:

4 A Yes, if you're referring
5 to specific information with the exact technique at
6 an exact location, or precisely how you are going to
7 develop borrow pits and so on, that's true, sir.

8 Q And in fact many of
9 these decisions will be made during the construction
10 process.

11 A Many of the decisions
12 will be made while construction is in progress on the
13 project, but not -- some of the decisions will be made
14 while construction is going on at that specific
15 location. Most of them will be made prior to construc-
16 tion at that specific location.

17 Q But there will be
18 decisions relating to many of these subjects that
19 will be made at particular locations on site in the
20 field.

21 A Yes.

22 Q And many of these
23 decisions will in fact not be made until after the
24 basic regulatory approvals have been obtained.

25 A That is correct, for
26 these types of decisions, yes.

27 Q And by "basic regulatory
28 approvals", do you understand that to mean a certificate
29 of public convenience and necessity from the National
30 Energy Board, and a right-of-way from the Department

Dau, O'Rourke, Williams
Cross-Exam by Lucas

1 of Indian & Northern Affairs?

2 A That's my understanding,
3 yes.

4 Q Mr. Dau, are you aware
5 that specific permits and approvals are required under
6 regulations made under the Territorial Lands Act with
7 respect to certain of the construction resources that
8 we have been discussing? In particular, timber,
9 gravel, borrow materials, and water.

10 A Yes.

11 Q And in the case of
12 water, in fact there is a separate Statute, the
13 Northern Inland Waters Act, and a Territorial Water
14 Board.

15 A I understand that, sir.

16 Q Now, I'm not asking you
17 for any legal opinions with respect to these matters,
18 but I would like you to state whether you have taken
19 into account in developing your construction schedule
20 the fact that you will have to apply for and obtain
21 the approvals under the regulations that I've mentioned
22 and under the Northern Inland Waters Act?

23 A Yes.

24 Q Have you allowed
25 specific blocks of time for these regulatory processes
26 in your construction plan and schedule?

27 A We think we've allowed
28 sufficient time, sir. I can't identify it as a
29 specific block of time. We have in the past and
30 currently are dealing with the regulatory people in

Dau, O'Rourke, Williams
Cross-Exam by Lucas

1 getting permits to -- for drilling programs, for
2 survey programs, and so on. We have gone through the
3 process many times with the Territorial people.

4 Q You're aware that with
5 respect to the water resource there's a possibility
6 of public hearings under the Northern Inland Waters
7 Act.

8 A I understand that there
9 are hearings, yes.

10 Q And you agree that
11 public hearings can be very time-consuming.

12 A Yes, they can, sir.

13 Q You 've mentioned that
14 you have had consultations with the relevant members
15 of the Department of Indian & Northern Affairs with
16 respect to these approvals?

17 A No, no, I didn't say
18 that, sir. I said that we have been obtaining land
19 use permits for the field programs and research pro-
20 grams, test sites and so on that we've conducted in
21 the past and are currently under way now. We have
22 had contacts with the Territorial people in obtaining
23 such approvals.

24 Q You -- have you had
25 contact with the Territorial Government officials, or
26 officials of the Department of Indian & Northern
27 Affairs?

28 WITNESS WILLIAMS: This has
29 been mainly with the Territorial Government with respect
30 to land use permits.

Dau, O'Rourke, Williams
Cross-Exam by Lucas

1 Q But there have been no
2 discussions with respect to members of the Department
3 of Indian & Northern Affairs regarding permits for
4 borrow materials, permits for timber and land use
5 permits for various other land use operations?

6 A I know we went through
7 that procedure, Mr. Lucas, with respect to Sans Sault.
8 We did get a quarrying permit there and we did deal
9 with forestry with respect to the tree cover. That's
10 a lot of years ago and I've forgotten the details,
11 specifically who we dealt with, but we could get that
12 for you.

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Dau, O'Rourke, Williams
Cross-Exam by Lucas.

1 Q And you have taken into
2 -- Mr. Dau, you have taken into account the fact that
3 in applying for these approvals with respect to water
4 withdrawals for example, you have to identify the
5 source of the water and you have to indicate the
6 quantities that you want?

7 WITNESS DAU:

8 A Yes, I understand that.

9 Q But you told me earlier
10 that many of these decisions with respect to quantities
11 of water and sources of water will not be made until
12 construction is in progress, will not be made until
13 you are out in the field.

14 A That type of an application
15 you would, I am sure, calculate the maximum quantity
16 that you required and make such an application, having
17 it clearly understood that it would be a maximum.

18 Q You anticipate then
19 getting a form of blanket approval for numerous
20 particular water withdrawals for example.

21 A It would be nice if we
22 could do that, yes. That is not what I was talking
23 about. The -- I said that we would not be able
24 to determine the exact amount of water required for
25 a snow road until the time that we were actually
26 constructing the snow road, but we can determine what
27 the maximum quantity of water would be under the
28 worse circumstance and you obviously would plan your
29 operation for that occurrence and at that stage you would,
30 I am sure in applications for water use, make an application

Dau, O'Rourke, Williams
Cross-Exam by Lucas

1 for the maximum quantity that could be required.

2 Q But you have also
3 told me that you couldnot identify specific sources
4 in some cases until you are actually out in the field.

5 A Yes, that would be
6 determined in this survey program, that would be
7 well in advance of the actual construction of the
8 road.

9 Q Okay, I will not pursue
10 that further. Mr. Commissioner, --

11 MR. GENEST: I might point
12 out to my friend that the application itself to the
13 minister that has been referred to is an application
14 not only for a right-of-way, but for all permits,
15 authorizations and approvals that the applicant may
16 require to construct and operate and maintain the pipeline
17 including a number of the things that he is talking
18 about. I refer to paragraph 16 .

19 MR. LUCAS : Yes --

20 MR. GENEST: So that the
21 application is there in the sense.

22 THE COMMISSIONER: Such
23 further and other relief.

24 MR. GENEST: Well, it is
25 specified, Mr. Chairman -- Mr. Commissioner.

26 MR. LUCAS: Well, with respect,
27 Mr. Genest, that is rather beside the point. Presumably
28 this inquiry has no authority to grant water licences
29 and quarrying permits and permits of that nature.

30 MR. GENEST: No, no, but the

Dau, O'Rourke, Williams
Cross-Exam by Lucas

1 application has been made to the Minister for those
2 permits and that is an application referred to this
3 Inquiry.

4 MR. LUCAS: I have come
5 to a natural break, Mr. Commissioner, if I
6 can go on further?

7
8
9 THE COMMISSIONER: Well,
10 I think that we would all like to take advantage of
11 this natural break, but there is nothing we can
12 do about it. If you do not mind struggling on for
13 another 20 minutes, Mr. Lucas, can you function for
14 20 minutes without -- if you need a break, that is
15 fine with me.

16 MR. LUCAS: I can carry on.

17 THE COMMISSIONER: They
18 say help is on the way -- While we are at this stage,
19 Mr. Lucas, while you are collecting your thoughts there
20 for a moment, yesterday some reference was made to
21 exhibit 99 and this relates to the extent to which it
22 would be required to blast the right-of-way from the
23 60th parallel to Richard's Island and then along
24 the Prudhoe Bay leg and I wonder if I could just ask you,
25 Mr. Williams, I think you were the expert on this.
26 Do you have 99 before you, Mr. Williams?

27 WITNESS WILLIAMS: McPherson.

28 A Yes, sir.

29 Q Along the Alaska/Yukon
30 border to Fort it says that 20% of the route

Dau, O'Rourke, Williams
Cross-Exam by Lucas

1 has to blasted.. Does that mean that from the
2 Yukon border to Fort McPherson along the coastal
3 route, you would be ditching four miles and then
4 blasting for one mile out of every five? Is that
5 what I am to gather from that?

6 A On an average, yes.

7 Q Then from Fort McPherson
8 to Travaillant Lake and Richard's Island to Fort
9 Good Hope you are blasting 9.3% which means you
10 would be ditching for 9 miles and then blasting for
11 about one mile out of every ten, from Fort Good Hope to
12 Fort Simpson, the same proportions appear to apply and
13 Fort Simpson to the 60th parallel you are down to
14 blasting along 3% of the route.

15 Now, is that on the assumption,
16 let's take the Alaska/Yukon border to Fort McPherson
17 where you ditch four miles out of every five, is that
18 on the assumption that you will develop a ditcher that
19 is capable of ditching in permafrost terrain? I
20 recollect your presentation two or three weeks ago
21 when you showed the new generation of ditching machines
22 that is being developed and the difficulties that you
23 are having with the teeth and you said that you did
24 not really have ditching machines developed now that
25 could ditch through permafrost but that you were confident
26 the technology would produce one by the time you
27 had to start into it.

28 Now, is that, have I summarized
29 where we are at on this?

30 A Just except for the last

1 couple of sentences, Mr. Commissioner, no, I hope
2 I did not say that. I thought I said that the new
3 generation ditching machines with the new teeth
4 development that has recently taken place, that we
5 are confident that this amount of ditching can be
6 accomplished with that equipment. We have been
7 asked by Canadian Arctic Gas to look into a larger
8 machine that will increase that percentage of wheel
9 type ditching and do it on a better production
10 rate, but no, I think that our tests show that we
11 can ditch the quantities shown on this exhibit 99.

12 Q Well, let me put it
13 this way. It says here that you are going to have
14 to blast 20% of the way from the Alaska/Yukon border
15 to Fort McPherson, that is along the coastal route,
16 -- now, that means you can ditch for 80% of the
17 way. Do you have a ditcher now, today, May the 14th,
18 that can actually go ahead and ditch that permafrost
19 along the 80% where you say you expect to ditch from
20 the Yukon border to the -- the Alaska/Yukon border to
21 Fort McPherson?

22 A Yes, sir, we feel
23 confident from the tests that have been conducted
24 that this can be done with present day equipment.
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Dau, O'Rourke, Williams
Cross-Exam by Lucas

1 Q Well, the new generation
2 ditchers that you showed us, that
3 you expected to use, as I understood it, had two types
4 of teeth that had been developed. One were a Swedish
5 type of teeth, the other were, I think, Canadian, but
6 I've forgotten.

7 A Yes sir.

8 Q My distinct impression
9 was that those teeth were not adequate. I may have
10 been relying^{too} much on those slides, I don't know, but
11 it seemed to me you were having an awful lot of trouble
12 with them, and you left me with the impression and if
13 it was a wrong impression you had better correct it.
14 But you left me with the impression that you didn't
15 have teeth, you hadn't developed teeth for the ditching
16 equipment that would enable you to ditch through perma-
17 frost, and I am taking the North Coast as an example
18 because presumably from say Fort Good Hope south you
19 have discontinuous zones, so the problems aren't quite
20 the same.

21 A Well, certainly we're
22 continuing the research to make improvements, but we
23 feel that the teeth that were produced for tests during
24 this past winter are much better than what we have
25 worked with in the past, and that they, if no improve-
26 ment is made, they will do the job; even at Sans
27 Sault five years ago we got in excess of 3,000 feet of
28 ditch with one set of teeth, with a machine smaller
29 and less horsepower and less capability than the new
30 generation equipment.

Dau, O'Rourke, Williams
Cross-Exam by Lucas

1 Q Let me ask you another
2 question about this blasting from the Yukon -- the
3 Alaska-Yukon border to Fort McPherson. It takes you
4 along the North Coast and then down the west side of
5 the delta. Is the 20% of the route that you must ditch
6 -- I mean that you must blast -- a sort of an overall
7 figure merely, or are you in a position to indicate
8 on a map the sections of the route from the Alaska-
9 Yukon border to Fort McPherson that you will have to
10 blast?

11 A Yes sir, if you look at
12 the table, the blasting quantities are defined by
13 terrain type. The first one is the R.S.R.O.W., that's
14 an outwash material that is probably fairly high in
15 sand and sand and gravel, and we say, that in that
16 section that you're speaking of there are 10.5 miles
17 of that terrain type between the Alaska-Yukon border
18 and Fort McPherson. That quantity is scaled off the
19 mosaics, that's the total amount of that terrain type
20 in that section, and we are taking the conservative
21 approach that all of that would have to be blasted.

22 Going down the list, the next
23 one is areas where there are shallow soils over rock
24 or gravel, another 5 1/2 miles. 9.1 miles of alluvial
25 fan deposit and 15.3 miles of active flood plain and
26 alluvial meander plain combined. I'm sorry, I missed
27 that, I'm on the wrong line, that was fossil flood
28 plain and active flood plain --

29 Q If we looked at the
30 alignment sheets we could -- and identified those

Dau, O'Rourke, Williams
Cross-Exam by Lucas

1 types of terrain, we would -- it would become apparent
2 to us where the blasting would occur.

3 A Yes sir.

4 Q Now, when you're blasting,
5 what are the requirements in terms of the number of
6 people you have to have in the crew as opposed to
7 using the ditcher, or does the ditcher come along
8 after the earth has been loosened by the blasting and
9 the procedures simply follow normally anyway?

10 A Well, it's desirable
11 to do the blasting ahead of stringing operations,
12 Mr. Commissioner, because if any material is thrown
13 there's a possibility of damaging the pipe. I think
14 we've explained earlier that we want to cut down the
15 throw to a minimum. We need the material for backfill
16 purposes. We want to --

17 Q Cut down the what to a
18 minimum?

19 A The throw of the material
20 from -- that has been blasted. So if we accepted
21 this table, most of the areas are well-defined. The
22 alluvial sand deposits and the fossil flood plains and
23 so forth, they can -- you can readily see them from the
24 photographs, and they can be defined. As soon as the
25 snow road is advanced to these areas, the blasting
26 crew can go ahead and do their work, but the
27 excavation would take place as the spread moves for-
28 ward, and it can either be done with backhoes or with
29 the ditching machine. We have done a bit of testing
30 on that and probably the preferable method is to

Dau, O'Rourke, Williams
Cross-Exam by Lucas

1 ditch the blasted material with the ditching machine.
2 It tends to break it up into smaller particles and
3 give you more uniform shape of ditch.

4 Q Well, you really, from
5 the point of view of crew, you simply have -- in the
6 operation you add this blasting crew on the front end,
7 so to speak.

8 A Yes, but there are some
9 areas like the third one listed there with the shallow
10 soils over rock, if your pre-drilling had not
11 identified all these locations then they would have
12 to be done later when it was discovered by the ditch-
13 ing machine that you were hitting rock that you hadn't
14 contemplated and the necessary arrangements would have
15 to be made to use a blast assist in that situation.

16 Q Yes. What is the
17 characteristic of these terrain types that obligates
18 you to use the ditcher -- to use the blasting as
19 opposed to the ditcher? Is it the presence of rock,
20 solid rock?

21 A Solid rock, well-consoli-
22 dated frozen gravels, and sands. They are the most
23 difficult.

24 Q The mere presence of
25 frozen ice and soil, ^{that's} something you can handle with
26 the ditcher, your tests indicate so far?

27 A Solid ice would be at
28 the very easy end of the scale as far as frozen
29 materials are concerned, yes sir.

30 MR. GENEST: Sir, are we clear

Dau, O'Rourke, Williams
Cross-Exam by Lucas

1 -- I'm very concerned at my dismal failure to get
2 my message across about the teeth when I was leading
3 Mr. Williams' evidence, that the impression was left
4 with you that the present-day technology was not as
5 far advanced for us to be confident that we could use
6 a ditcher in its present state.

7 THE COMMISSIONER: Well, you
8 were confident or at least Mr. Williams was confident
9 then, as now, and as always, I suppose; but I got the
10 impression and since the matter had been raised yester-
11 day I wanted to go back and see if I understood him
12 that in this second generation or new generation of
13 ditcher , you were still working away at the whole
14 teeth situation and that the Swedish teeth and some-
15 body else's teeth, a second variety of new teeth had
16 not worked out. Maybe I was mesmerized by the slides
17 that showed these teeth in various stages of --

18 MR. GENEST: My impression
19 was that the slides showed these new teeth showed
20 a much better pattern of wear and less breakage
21 than the teeth that were already doing an adequate
22 job, but we were seeking to improve it. That's at
23 least the impression I intended to convey, and obvious-
24 ly failed to do. I wonder if we could have a clear
25 statement by Mr. Williams really on the status of it?
26 I thought that's what the record would show.

27 THE COMMISSIONER: Well, Mr.
28 Williams has corrected me, or at least told me that
29 my impression was wrong.

30 MR. SCOTT: Mr. Commissioner,

Dau, O'Rourke, Williams
Cross-Exam by Lucas

1 perhaps the point hasn't been made, and may explain
2 it, and perhaps I'm stating something that is obvious,
3 I don't know, is that teeth are replaceable and will be
4 replaced at intervals.

5 A Yes, that is certainly
6 true, Mr. Scott. The aim, of course, is to extend
7 the life of the teeth or have teeth that will have
8 an extended life; but certainly they can be replaced,
9 there are expenses with respect to purchasing the
10 teeth and hauling them in, but taking that all into
11 account, even if you can only get a couple of thousand
12 feet with a set of teeth, as opposed to our objective
13 of four or 5,000, it is still much more economical
14 than drilling and blasting.

15 THE COMMISSIONER: You're
16 saying then that if today we installed you with the
17 best ditcher and the best teeth are available today,
18 we installed you on the Alaska-Yukon border and said,
19 "All right, we'll see you in Fort McPherson in so
20 many months," that you could do 80% of that with the
21 ditcher and only 20% with blasting, that's what you're
22 saying?

23 A That is our assessment,
24 sir, yes.

25 MR. SCOTT: Mr. Commissioner,
26 the point I was trying to make was intended to be
27 helpful. Maybe Mr. Williams just in instinct shied away,
28 but it's, as I --

29 MR. GENEST: He agrees; what
30 do you want?

MR. SCOTT: I want to make it

Dau, O'Rourke, Williams
Cross-Exam by Lucas

1 a contribution; that it's entirely a question of
2 economics, is it not, what is being striven for is
3 a tooth that will last longer but if it isn't
4 developed you'll just have to use more and replace
5 them more often?

6 A Yes, thank you, Mr.
7 Scott.

8 (LAUGHTER)

9 THE COMMISSIONER: Yes, thank
10 you.

11 (LAUGHTER)

12 I think we'll adjourn for a
13 few minutes.

14 (PROCEEDINGS ADJOURNED FOR FEW MINUTES)
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1 (PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)

2 MR. MARSHALL; Mr. Commissioner,
3 perhaps before Mr. Lucas commences once again with
4 his cross-examination I can respond to some requests
5 for information from Mr. Bayly.

6 He asked about the Inuvik
7 snow road tests and the obtaining of additional
8 data, the plans are to monitor the snow road tests
9 from the vegetation point of view during August of
10 this year and likely past that point. The investigations
11 will measure the active layer changes and plant
12 community changes. The preliminary report that was
13 referred to by Mr. Bayly will be updated this fall and
14 will likely be available in the biological report
15 series in due course.

16 The other point he asked about
17 was whether or not there had been studies of the
18 effects of snow removal on North Slope lakes. I am
19 instructed that a final review has not yet been
20 completed, however, that the work is now underway
21 reviewing the literature on this subject.

22 THE COMMISSIONER: Thank you,
23 Mr. Marshall, you got that, did you, Mr. Bayly?

24 MR. BAYLY: Yes, thank you, Mr.
25 Commissioner. Thank you, Mr. Marshall.

26 MR. LUCAS:

27 Q To continue, Mr. Dau,
28 I will refer to the practice known as Arctic construction
29 techniques that is referred to in section 13 A of
30 the application. As I understand it, Arctic construction

Dau, O'Rourke, Williams
Cross-Exam by Lucas

1 techniques are special construction techniques that have
2 been developed for use in areas in which there is
3 sensitive permafrost terrain, is that correct?

4 WITNESS DAU:

5 A Yes, frost terrain
6 with high ice contents.

7 Q And that generally
8 speaking this technique will be used north of
9 60 degrees?

10 A In a general way, yes.

11 Q Now, in the discontinuous
12 permafrost zone, will the Arctic technique be used exclus-
13 ively or would you see changing from Arctic techniques to
14 conventional techniques to accomodate the soil conditions?

15 A The latter , sir, we
16 would change.

17 Q Now, can you tell us
18 at this stage precisely where you will be using
19 Arctic construction techniques and where you will
20 be using conventional construction techniques?

21 A No.

22 Q When can you tell us
23 this?

24 A Again, it would be
25 after the detailed field program and survey stage,
26 during those programs we would determine the --

27 Q How long is that going
28 to take?

29 A that would be conducted
30 over a summer season.

Dau, O'Rourke, Williams

Cross- Exam by Lucas.

1 Q So that you would not
2 be in a position to indicate precisely where Arctic
3 construction techniques will be used until just
4 prior to construction?

5 A Not just prior to construction.
6 It would be -- it would be almost a year ahead of
7 construction. The survey is done in a summer season.
8 The information would be utilized in the final
9 design of the system and the determination of the
10 techniques that would be required, that we would plan
11 to do that survey.

12 Q So that approximately
13 one year prior to construction in a particular section
14 of the line in the discontinuous permafrost zone you
15 would be in a position to say exactly where you will
16 be using Arctic techniques and where you will be
17 using conventional techniques, is that correct?

18 A That is correct.

19 Q And there is no possibility
20 of variation during the construction process?

21 A Oh, I am sure that
22 possibility exists. It would be in my view a very
23 minor amount that would, that could change. I do
24 not think that we should be so rigid that if circumstances,
25 as they develop in the field indicate that it would be
26 much better to extend the Arctic technique in some areas,
27 that should be done. I think that there has to be
28 some sort of a review at the construction phase, the
29 determination that all of the information that has
30 been previously gathered is accurate. But again it

Dau, O' Rourke, Williams
Cross-Exam by Lucas.

1 | would be in my view a very minor percentage.

2 | Q Am I correct in stating,
3 | Mr. Dau, that in the discontinuous zone along a pipeline
4 | route permanently frozen areas may alternate with
5 | unfrozen areas within relatively short distances? .

6 | A that is right.

7 | Q Could you
8 | explain then, how you propose to change your construction
9 | techniques within short distances, as you encounter
10 | different soil conditions?

11 | A I do not quite understand
12 | the question, the techniques are explained in the
13 | application, essentially the major difference is
14 | whether grading of the right-of-way is permitted or
15 | whether a snow road and a snow preparation over
16 | the right-of-way is utilized.

17 | Q So when, if you are
18 | proceeding with conventional techniques and you
19 | encounter a permanently frozen area, you suddenly stop
20 | grading?

21 | A No, it would depend on
22 | the soil type. It would depend on the ice content
23 | of the soil. There would be areas of permafrost where
24 | there would be nothing the matter with grading some
25 | areas of permafrost that would not subside in melting
26 | and so on.

27 | Q But whether or not
28 | that would be done would be a judgment made in the
29 | field when you encountered the ice rich zone?

30 | A No, I did not say that.

1 I said that we -- there could be minor areas where that
2 can occur, where the information determined during
3 construction indicated that perhaps you should extend
4 the Arctic technique. I think that we are going
5 to find the determination of what technique is used
6 in a particular area by far -- as far as percentages
7 is concerned -- would be determined at least a
8 year ahead of time, ahead of construction.

9 Q There is no difference in
10 equipment used in the two techniques?

11 A No, they require some
12 snow making equipment for -- if it is necessary, but
13 essentially, no. The equipment is essentially the
14 same.

15 Q It is essentially
16 the same --

17 A Mmm-hmm.

18 Q So if you were working
19 along using conventional methods and you encountered
20 an ice rich area you would break out the snow making
21 machines and have a look at the dozer blades and decide
22 whether you are going to do a little less grading and then
23 carry on.

24 A I think that is a possibility.
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Dau, O'Rourke, Williams
Cross-Exam by Lucas

1 Q Just one more question
2 on this subject, Mr. Dau. When you begin construction
3 in a particular area in the discontinuous zone, will
4 you have advanced your soil knowledge of the route to
5 the point where you can pin-point exactly the areas of
6 ice-rich soil?

7 WITNESS DAU: We will have
8 advanced our knowledge; whether we can exactly pin-
9 point them, I don't know. I'm sure that -- well, in
10 my view there would be further drilling beyond what
11 we have today. There would be obviously a program
12 during the survey^{phase} of probing to see whether there is
13 in fact permafrost in areas, and we would be utilizing,
14 I'm sure, some of the geophysical techniques of
15 determining areas of permafrost, bedrock and so forth.
16 We will have a lot more information at that stage
17 than we do now.

18 Q So it's not inconceivable
19 then that you could have some surprises just in
20 advance of construction in a particular area?

21 A That's not inconceivable,
22 no.

23 Q Will the Arctic construc-
24 tion techniques that are explained in Section 13-A
25 be used to construct the pipeline through bog or
26 fen areas in the discontinuous zone?

27 A It would depend on
28 whether permafrost was present. In areas of high
29 ice content permafrost, yes, we would use an Arctic
30 technique.

Day, O'Rourke, Williams
Cross-Exam by Lucas

1 Q You have developed no
2 special construction techniques to deal with the
3 possibility of encountering fen areas along the route?

4 A Nothing other than what's
5 listed on the application.

6 Q Mr. Day, have any field
7 studies been carried out in permafrost regions to
8 test the viability of the Arctic construction tech-
9 niques proposed in the application?

10 A The snow road at Inuvik
11 is such a test.

12 Q But you haven't carried
13 out a full-scale operation from snow roads right
14 through ditching, lowering in and so on?

15 A No sir.

16 Q And you don't think it's
17 necessary to do so?

18 A No, I do not.

19 Q Why?

20 A Well, I think the
21 techniques, the information we have now, in my opinion,
22 are sufficient to -- we have the confidence that
23 they are adequate and appropriate.

24 Q And you're relying then
25 on experience in other areas and under other conditions,
26 basically?

27 A Yes, that's true.
28 Essentially the only difference is the -- the primary
29 difference is the matter of grading of the right-of-
30 way.

Dau, O'Rourke, Williams
Cross-Exam by Lucas

1 Q And you're making a
2 judgment as to the kind of adaptation of the conven-
3 tional methods that is required to -- that is required
4 for northern conditions?

5 A Yes.

6 Q But it is a judgment?

7 A Yes.

8 Q In the event, Mr. Dau,
9 that you are the victim of one of the little surprises
10 as to soil ice conditions that we discussed earlier,
11 and it's necessary to change from a conventional
12 technique to the Arctic technique, or in the event that
13 it appears to be necessary to do so, who makes that
14 decision?

15 A The decision in the
16 field I would think would be an engineering, primarily
17 an engineering decision. It obviously has environ-
18 mental inputs. It's in the geotechnical area, really.

19 Q Who would be responsible
20 for making that decision on a particular spread?

21 A I would think it would
22 be the resident engineer on that spread.

23 Q And you suggest he would
24 have advice from his environmental consultants first?

25 A I'm sure he would, yes.

26 Q And you have recommended
27 as part of your construction plan that that kind of
28 consultation take place?

29 A Yes.

30 Q Mr. Dau, in the

Day, O'Rourke, Williams
Cross-Exam by Lucas

1 construction plan you indicate that a right-of-way
2 120 feet wide is proposed, and that this includes
3 a working lane approximately 35 feet wide.

4 A Yes.

5 Q And adjacent to that is
6 I guess what I could describe as a traffic lane approxi-
7 mately 30 feet wide, which would be a snow road as
8 well. Is that correct?

9 A That's a snow road,
10 yes sir.

11 Q So they're both snow
12 roads, really?

13 A Yes.

14 Q The working surface and
15 the traffic lane?

16 A Yes.

17 Q Are you aware of the
18 fact that the Trans-Alaska Oil Pipeline has been
19 required in many sections to use a much narrower
20 right-of-way?

21 A I've heard it mentioned,
22 yes.

23 Q Are you aware of the
24 width?

25 A No, I'm not, sir.

26 Q Mr. Williams, do you have
27 any information on that?

28 WITNESS WILLIAMS: No sir.
29
30

Dau, O'Rourke, Williams
Cross-Exam by Lucas

1 THE COMMISSIONER: Do you, Mr.
2 Lucas?

3 MR. LUCAS: Well, I am advised
4 by my expert advisors that in some sections of the
5 Alyeska line, a right-of-way only 55 feet wide has
6 been stipulated.

7 MR. MARSHALL: Excuse me, Mr.
8 Lucas, does that refer to the access, the permanent
9 road that's being built alongside as well, or is that
10 something separate?

11 MR. LUCAS: That does not
12 refer to the haul Road, that would not include the
13 haul Road.

14 Q Now, what I'm getting
15 at, Mr. Dau, is whether it is necessary to have a
16 full traffic lane 30 feet in width all the way along
17 the right-of-way? Would it be possible to get along
18 with turn-outs constructed at intervals along the
19 right-of-way?

20 WITNESS DAU: In my view--

21 MR. GENEST: Would you define
22 "turn-outs" for us, Mr. Lucas?

23 MR. LUCAS: Well, basically
24 what I am suggesting is that the traffic lane consists
25 only of very short segments, say every quarter of a
26 mile or every half-mile, rather than being a continuous
27 road alongside the working surface, so that equipment
28 could pass, for example.

29 A That would be much less
30 desirable, in my view very inefficient.

Dau, O'Rourke, Williams
Cross-Exam by Lucas

1 Q Could you operate under
2 those conditions and maintain the schedule that you've
3 proposed?

4 A I have not investigated
5 it in detail. I would suspect that it would affect the
6 schedule.

7 Q But you haven't looked
8 into that?

9 A I have not looked into it.

10 Q Let me suggest another
11 right-of-way configuration, Mr. Dau. A working lane
12 of 30 feet -- and perhaps you could refer to the schem-
13 atic included in Section 13-A -- a working lane of
14 30 feet, a traffic lane of 30 feet, 7 feet for the
15 ditch, and approximately 23 feet to accommodate the
16 spoil mound which I believe adds up to 90 feet. Could
17 you get along with 90 feet?

18 A No sir, in my opinion the
19 appropriate width would be 120 feet. I would think the
20 width that you've suggested would be too restrictive.

21 Q And your opinion is that
22 you simply couldn't operate with a 90-foot right-of-
23 way and maintain the schedule that you have proposed?

24 A That's correct.

25 Q You haven't investigated
26 that thoroughly.

27 A I have not.

28 Q But that is your opinion
29 here today.

30 A That's correct.

Dau, O'Rourke, Williams
Cross-Exam by Lucas

1 Q Mr. Dau, to your knowledge
2 has any gas pipeline of similar size ever been construc-
3 ted under similar conditions to those that would be
4 encountered by the proposed Mackenzie Valley line?

5 MR. GENEST: Mr. Commissioner,
6 we've had that question seven times and the answer,
7 I presume, will be the same.

8 MR. LUCAS: I'm thinking in
9 terms of remoteness and extreme temperatures.

10 A I'm not aware of one.

11 THE COMMISSIONER: That's the
12 eighth time. It's still the same. You haven't
13 been here all along; we're just passing the time of
14 day here, forgive us.

15 MR. LUCAS: I've been waiting
16 my turn, Mr. Commissioner, very patiently.

17 THE COMMISSIONER: Well, you
18 carry on.

19 MR. SCOTT: It's one of the
20 key parts of the case, whether Mr. Genest wants to
21 ignore it or not, but the thing's never been done
22 before.

23 MR. GENEST: Well, you never
24 gain anything by repetition.

25 MR. LUCAS: Mr. Dau or Mr.
26 Williams, I'd like to refer you to the proposed
27 crossing of the Great Bear River, and direct you to
28 Section 13-A, 2.3.1, the bar graph noted as figure 4.

29 WITNESS WILLIAMS: Yes sir.

30 Q This is for construction

Dau, O'Rourke, Williams
Cross-Exam by Lucas

1 spread C, and it appears that the Great Bear will be
2 crossed in the first summer of construction; is that
3 correct?

4 A The bar graph suggests
5 that it will be constructed in the summer preceding
6 the mainline work in that area.

7 Q Now, --

8 A That is the actual
9 installation. The work on the river extends for the
10 better part of the year.

11 Q Now I believe we estab-
12 lished earlier that you couldn't say at this stage
13 whether a berm type construction technique will be
14 used for this crossing.

15 A No sir, that is one of
16 the options we have.

17 Q Now, would you agree,
18 Mr. Williams, that whatever crossing construction
19 technique is used, there is likely to be some downstream
20 disturbance in the nature of increased siltation?

21 A Yes, it would be minor,
22 Mr. Lucas, because that particular river has a rock
23 and gravel bed, so the siltation resulting from the
24 excavation would be much less than several other
25 rivers north of 60.

26 Q I'd just like to confirm,
27 Mr. Williams, that ditching for the Great Bear crossing
28 will be in progress between June 15th and July 30th?

29 A The way I read the chart,
30 Mr. Lucas, is that it's from the 1st of July to the

Dau, O'Rourke, Williams
Cross-Exam by Lucas

1 end of September.

2 Q Looking at the ditch
3 excavation operation --

4 A The third line from the
5 bottom.

6 Q Yes, my eyesight is
7 going as well so that ditch excavation will take
8 place at least during part of that period, June 15th
9 to July 30th.

10 A Well, this suggests
11 July 1st, Mr. Lucas, rather than June 15th.

12 Q O.K., but it would take
13 place during part of the period that I mentioned?

14 A During part of that
15 period, yes.

16 Q Now, will blasting in
17 the river bed be required to cross the Great Bear?

18 A Yes sir, in our
19 opinion.

20 Q Have you had advice from
21 your environmental consultants with regard to grayling
22 migration downstream during the period that I men-
23 tioned?

24 A Yes sir.

25 Q And you've taken their
26 advice into account in developing the construction
27 plan for the Great Bear crossing.

28 A Yes sir.

29 Q And how has their advice
30 affected your proposal to use blasting techniques?

Dau, O'Rourke, Williams
Cross-Exam by Lucas

1 A The blasting, Mr. Lucas,
2 is in the fifth line from the bottom, that suggested it
3 takes place between January 1st and the end of March
4 in the wintertime. The proposal there is to work from
5 the ice to do the necessary drilling, install the
6 explosives, and do the blasting in those months, then
7 leave it and do the excavation in the following
8 summer.

9 Q So the blasting will
10 take place the previous winter and then there will be
11 only excavation the following summer?

12 A The excavation and the
13 pipe installation.

14 Q And there will be no
15 blasting during the summer period?

16 A That's correct, within
17 the river channel; there may be some on the embankments.

18 Q Now the process of
19 ditching and installation then will carry right
20 through to, as I read this chart, approximately
21 October 30th?

22 A Ditching and installation,
23 yes sir.

24 Q Have you received any
25 advice from your environmental consultants with respect
26 to spawning white fish runs during the period, August
27 15 to October 30?

28 A We certainly had quite
29 a long session on the -- with the fish biologists on
30 particular
this river crossing, Mr. Lucas. I don't recall the

Dau, O'Rourke, Williams
Cross-Exam by Lucas

1 details but we had no strong recommendations that the
2 procedures that we were proposing would be serious.
3 We just -- besides, there is just not much
4 alternative.

5 Q You don't remember any
6 spawning white fish?

7 A I don't specifically
8 recall it being mentioned.

9 Q And in any event there
10 is no alternative.

11 A Not any reasonable
12 alternative, Mr. Lucas, in my opinion.
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Dau, O'Rourke, Williams
Cross-Exam by Lucas

Q Did your environmental consultants recommend any precautionary measures be taken to avoid downstream disturbance during ditching and installation processes?

A Well, again, that particular river as we mentioned is bedrock and boulder pavement, and it is not expected that the excavation and installation work would increase the siltation load appreciably.

Q So there was no advice from your environmental consultants on that matter?

A I do not recall them suggesting some alternative.

Q Did you ask them?

A Again, that would be inherent in the discussion.

Q There was simply general discussion?

A Oh, general and in some areas quite detailed discussion, particularly with respect to that berm construction.

Q But they did not recommend any particular remedial measures?

A With respect to the berm I think one thing that was possibly suggested that we didn't mention earlier, that culverts could be installed in that berm on a temporary basis to reduce the velocity in the mainstream because of the berm construction. There was a concern about the increased velocity with respect to the migration and the movement of the -- and I think in this case it was the grayling fry that was of particular concern,

Dau, O'Rourke, Williams
Cross-Exam by Lucas

1 the juvenile grayling.

2 Q Okay, I would like to move
3 on, Mr. Williams, and take a look at a sequence of
4 activities of a particular spread during a particular
5 period of time and the one that I would like to look
6 at is spread C operating in the Fort Norman area in
7 the second construction winter.

8 Now, we can refer to the
9 same figure, figure four that we looked at with
10 respect to the Great Bear River and I am looking
11 at the second construction season, so that would
12 be M.P. 346 to M.P. 427 on the Delta-Caroline.

13
14 THE COMMISSIONER: I am
15 sorry, what page is this, or what --

16 MR. LUCAS: Sir, it is section
17 13A 2.3.1 and it is figure four of the bar graphs
18 that are found in that section. It is very difficult
19 to find, I can assure you.

20 THE COMMISSIONER: I am
21 sure it is, I do not even have 13A here.

22 MR. LUCAS: What I would
23 like to do, Mr. Williams is attempt to go through the
24 activities, the major activities of this construction
25 spread during that season in sequence. Now, first of
26 all, when do you expect to be able to start snow road
27 construction near Fort Norman to launch the activities
28 of spread C?

29 A The bar graph,
30 Mr. Lucas, suggests starting in the first of November.

1 Q Now, that refers to

2 --

3 A I am sorry, the first
4 of October.

5 Q Now, let's get this
6 straight. As I read this that is under the mobilization
7 head -- under the grading head it indicates the first
8 of November.

9 A Yes, and a few lines above
10 that under snow and ice roads it says October the
11 first. This of course is in the discontinuous zone,
12 Mr. Lucas and the grading there would be the
13 work where it was determined that conventional winter
14 construction techniques could take place, that
15 would be the actual grading. The snow road work we
16 would plan to start as early as possible and this
17 suggests the first of October.

18 Q And you -- on what do
19 you base your suggestion that you would be able
20 to start snow road construction on the first of
21 October, have you done any tests, any research?

22 A We have a fair bit
23 of meteorological data in this area from Norman
24 Wells, from observations of the studies that have gone
25 on in the past five years. It is essential to meet
26 the schedule that we start as quickly as conditions
27 will allow. We would start earlier than that if we
28 thought it was feasible.

29 Q Is it conceivable that
30 conditions would not be appropriate for snow road

1 construction in fact until sometime later?

2 Possibly well into November, is that a possibility?

3 A I cannot conceive that,
4 Mr. Lucas, I am sure that snow manufacturing, the
5 snow manufacturing technique could start the first
6 of October and I cannot see many thaw days in
7 October that would preclude that technique.

8 Q And unseasonable
9 thaw would make it, would probably delay your start
10 though, and that is a possibility.

11 A I would think very,
12 very remote.

13 Q Is it possible that
14 construction of snow roads would be delayed by a
15 small early snowfall that occurred when the ground
16 was not yet frozen and served as an insulator, would
17 conditions of that kind possibly delay snow road
18 construction?

19 A No, we would I think
20 on the slide presentation we showed going in with
21 a soft track vehicle or it could be a rologon
22 or some terrain vehicle of that sort which would
23 compact the snow and would reduce the insulating
24 effect.

25 Q Now, Mr. Williams,
26 what has to be done between the time, between the
27 date that you begin to construct your snow roads
28 for spread C and the date that the first ditching
29 is commenced and how long is that likely to take?

30 A Well, in the plan the

Dau, O'Rourke, Williams
Cross-Exam by Lucas

1 clearing would be done prior to the year of construction,
2 either in the previous winter or in the previous
3 summer. In our opinion it is essential that that
4 be done prior to the fall of the major construction.
5 Then as suggested the early snowfall would be compacted
6 as it falls to get rid of the insulating effect
7 of the snow and to get more rapid freezing of the
8 active layer. Then if there was still not sufficient
9 snow to provide adequate cover, protective cover
10 to the vegetation, and this is in areas where it
11 has been predetermined that Arctic techniques would
12 be required, then snow manufacturing would start
13 in order to ensure an early start of construction, but
14 the ditching and the stringing of the pipe would not
15 be started until an adequate protective snow cover
16 was provided.

Dau, O'Rourke, Williams
Cross-Exam by Lucas.

1 That does not mean that the
2 haul road, the snow road, the haul road has to be
3 up to high standards in the early going. When you're
4 working close to the camp, the travel distance is
5 shorter so you can put up with a rougher snow cover
6 than you can when you get farther from the camp and
7 it's important that you have a snow road that you can
8 make good time on. Otherwise you spend all your time
9 travelling.

10 So it varies, Mr. Lucas, with
11 the conditions at the time. If there is not adequate
12 snow to provide suitable cover, it will have to be
13 made or hauled in; but it is important to get an early
14 start.

15 Q Well, would I be wildly
16 wrong in suggesting that it could take as much as
17 three months from the time initial snow road construc-
18 tion begins until ditching, and then the welding and
19 lowering in and so on could begin?

20 A Yes sir.

21 Q And --

22 A That means you would be
23 wildly wrong, yes.

24 Q Could you give me an
25 estimate of the time between the initiation of those
26 two activities?

27 A Well, they could be
28 very close, Mr. Lucas. As soon as a few miles of
29 right-of-way is adequately snow-covered, those other
30 operations can begin, providing you have your people

Dau, O'Rourke, Williams
Cross-Exam by Lucas

1 in camp.

2 Q Well, could you explain
3 then why your bar graph indicates that you feel you
4 could begin snow road construction on October 1st,
5 but it indicates that ditching would not begin until
6 the end of November?

7 A This is conservative,
8 that, that is the worst case that we're showing. If
9 there is any possibility of improving that, we cer-
10 tainly will.

11 Q And all this time then
12 is being allowed for the various contingencies involved
13 in snow-making and ice-capping and so on that may be
14 necessary to get a proper working surface. Is that
15 correct?

16 A The bar graph indicates
17 that even if we can't get started until the 1st of
18 December, that the schedule can be met. But every
19 effort would be made to start earlier than that.

20 Q And you feel that
21 December 1st would be the latest you could possibly
22 conceive of ditching commencing for this spread.

23 A I think that's correct.

24 Q Now, in your earlier
25 evidence I believe you indicated that construction
26 spread~~s~~ would move at an average rate of about 21 miles
27 per month. Now, is that a reasonable rate to assume
28 for this particular spread in this particular area?

29 WITNESS DAU: In this particular
30 spread, Mr. Lucas, the rates in miles per calendar day

Dau, O'Rourke, Williams
Cross-Exam by Lucas

1 is 0.6, and the estimated rate in miles per working
2 day is 0.85.

3 Q Which suggests what,
4 about -- that would be in the order of about 20 miles
5 a month, would it?

6 A I believe it's 18, sir.

7 Q Sorry?

8 A 18.

9 Q 18. Now, with respect
10 to snow roads, Mr. Williams, is it anticipated that
11 snow roads will be used in the latter part of March
12 and even into April in this section?

13 WITNESS WILLIAMS: Yes sir.

14 Q And would you expect
15 that during this period some melting is likely to
16 occur?

17 A In the early part of
18 April, that is possible, yes.

19 Q And that you would
20 have to take some of the remedial measures that you
21 mentioned, using sawdust and shavings and so on.
22 Is that correct?

23 A No, that was just to
24 repair pot-holes in the haul road you were suggesting.

25 Q What would you do about
26 melting?

27 A We'd put up with it
28 until the situation became serious, and shut things
29 down and get out of there.

30 Q And you wouldn't

Dau, O'Rourke, Williams
Cross-Exam by Lucas

1 conceive of a situation in which you would have to
2 repair or continue to attempt to make snow, for
3 example, to maintain your snow road into April?

4 A That hasn't been included
5 in our plan.

6 Q Mr. Williams, would you
7 agree that during the process of construction, various
8 dark-colored material, including soil and rock and
9 perhaps bits of God knows what, will be deposited on
10 both the snow road working surface and on the traffic
11 lane? Bits of spoil in particular.

12 A Yes, I can see that
13 happening, yes.

14 Q And having had consider-
15 able experience in construction, would you agree that
16 there could be a considerable droppage of spoil
17 material and so on on these snow roads?

18 A No, I would see it
19 limited to areas where you had to haul in selected
20 backfill, for instance, Mr. Lucas. It wouldn't be
21 the normal practice to be hauling soil to the site
22 of work.

23 Q Though some soil is
24 bound to get thrown on the snow road surfaced by
25 the pipe-laying equipment and so forth as it moves
26 about and along. Is that reasonable?

27 A On the working side, the
28 working area; hopefully not on the snow road itself.

29 Q Now, would you agree that
30 the presence of this material on the snow road surface

Dau, O'Rourke, Williams
Cross-Exam by Lucas

1 will accelerate snow road melting?

2 A Yes sir.

3 Q In the snow road tests that
4 were carried out at Inuvik, did you test this particular
5 problem?

6 A No sir.

7 Q Do you anticipate that
8 the presence of dark material on the right-of-way may
9 shorten the spring life of your snow roads?

10 A I can see that happening,
11 yes sir.

12 Q But you haven't specifi-
13 cally studied or carried out tests.

14 A This occurred at the
15 snow road test that was done at Norman Wells at the
16 test site there, and I don't have the figures here
17 but I think the trafficability tests there did ter-
18minate in the first half of April; but I'm not certain
19of that number, Mr. Lucas, and certainly on that road
20where quite a bit of ice was used, the surface was
21dark.

22 Q Has this factor been
23 taken into account in the development of the construc-
24tion schedule?

25 A No sir.

26 Q You've mentioned earlier
27 that it will be necessary to repair snow roads in
28 certain circumstances. Would you anticipate that
29 operations would have to be shut down in certain
30 areas for certain periods while snow road repairs were

Dau, D'Rourke, Williams
Cross-Exam by Lucas

1 being carried out?

2 A Yes, I can see this
3 happening, but it could be done in the night when the
4 traffic is low on that road.

5 Q But you would anticipate
6 some down time as a result of snow road repair and
7 ice-capping.

8 A If it was carried out
9 in selected time periods, I don't think so, Mr.
10 Lucas. I think we indicated on the slide presentation
11 that traffic could resume within a half an hour after
12 repair procedures had taken place, and if the repair
13 work was done at selected times I wouldn't see it
14 holding up operations appreciably.

15 Q So you haven't taken this
16 into account then in developing your construction
17 schedule.

18 MR. GENEST: Well, he just
19 said it wouldn't affect it. He's obviously taken it
20 into account.

21 MR. LUCAS: I guess perhaps
22 he has, Mr. Genest.

23 THE COMMISSIONER: So that
24 objection is a good objection then.

25 MR. LUCAS: Q Mr. Williams,
26 with respect to welding, and I'm looking at this
27 in the context of activities on spread C in the
28 second construction winter, in particular, in
29 Section 13 A of the application at 6.5.5, page 42,
30 heading, "Welding", under "Procedure qualification ",

Dau, O'Rourke, Williams
Cross-Exam by Lucas

1 it is stated that:

2 "Welding procedure tests will be conducted
3 under the expected adverse temperature and
4 weather conditions to establish detailed
5 welding procedures which will set the
6 parameters for such matters as pre-heating,"
7 and a number of matters follow. What I would like to
8 know is whether these tests have been carried out.

WITNESS DAU:

9 A I think some have, but
10 there are further welding tests planned. I thought
11 that was dealt with by Mr. Holmberg. I wasn't
12 here at that stage.

13 MR. LUCAS: I wasn't either.

14 MR. GENEST: I was and I can't
15 remember.

16 WITNESS WILLIAMS: It is a
17 better question for the design panel that preceded
18 this one.

19 MR. LUCAS: Well, I think
20 Mr. Williams or Mr. Dau, I would like to ask whether
21 the parameters for welding under adverse temperature
22 conditions were matters that were taken into account
23 by this panel in developing its construction schedule.

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DAu, O'Rourke, Williams
Cross-Exam by Lucas

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A Yes, sir.

Q But these tests have not been carried out, tests that have been mentioned in the application.

A There has been a considerable amount of welding done in northern Alberta in temperatures similar to what we are going to experience here, Mr. Lucas, the tests, wherefore the specific type of pipe that is required for this job and preliminary indications are that there is no special problem that the procedures normally used in winter construction in northern Alberta are probably adequate.

Q Well, let me get this straight. Did you know the temperature constraints on welding, on this type of pipe in the type of conditions to be encountered on this line when you developed your construction schedule?

A In a general manner, yes, not in -- not real specific, but the we had advice from our metalugist,

Q What do you mean in a general manner, within plus or minus ten degrees?

A Just what I have said, Mr. Lucas, that there was no special problem over and above what is normally experienced in winter construction in northern Alberta. This was the general advice of our metalurgist.

Q And that is the basis, that is the assumption on which you developed this

1 construction plan?

2 A Yes, sir.

3 Q Did you have any
4 information at all on temperature extreme conditions
5 along the part of the line that we are looking at
6 in connection with spread C, did you know for example,
7 the number of days likely to be below 20°F?

8 A Yes, we have that data
9 from the station at Norman Wells over quite a few
10 years.

11 Q Now, getting back
12 to spread C, which is proceeding at a rate of 18 miles
13 per month and presumably making good progress, it
14 must move a total of 81 miles to complete its task as
15 I read the chart.

16 A Yes, sir.

17 Q So that according to
18 the dates you have suggested it could be expected
19 to complete its work around the first of April?

20 A Yes, sir.

21 Q Is it your opinion that
22 it is very unlikely that it will be later, much later
23 than the first of April, could you conceive of
24 construction activities going to April 15th in this
25 area for example?

26 A Mr. Lucas, this is
27 the second year of construction. The year prior
28 to this I am sure we will have a pretty good idea
29 of what can be accomplished within reasonable bounds.
30 Now, the weather can be a serious factor. If

1 during the first winter's construction we found that
2 this type of schedule is very difficult to meet, then
3 we would see the implementation of one of the remedial
4 measures suggested in response to the question number
5 25 of the Pipeline Assessment Group.

6 Q So that the weather is
7 the big unknown factor?

8 A Yes, sir. But the
9 spread will have to be equipped to carry on work
10 in adverse weather conditions.

11 Q I have referred to adverse
12 weather conditions respecting welding, what were
13 the assumptions that went into this construction
14 plan with respect to other construction activities
15 including ditching, pipe stringing, did you make
16 any assumptions as to the extreme adverse conditions
17 under which those activities could be carried out?

18 A Those items are built
19 into out schedule, yes. Are you speaking about like
20 Mr. Bayly I think yesterday that all the equipment is
21 broken down and we have no snow to build roads and
22 the caribou are in the way and --

23 Q No, no, no, I am not --

24 A Does this all happen
25 at once --

26 Q What I am interested
27 in is whether you made any specific assumptions
28 as to extreme adverse conditions under which activities
29 like stringing and ditching and so on could be
30 carried out, that is, did you assume that ditching

1 would stop when it got, when the temperature dropped
2 to a particular point?

3 A No, I think, Mr. Lucas
4 that that is one operation that can continue in
5 extreme low temperatures because the operator is
6 in a shelter.

7 Q What about the stringing
8 of pipe?

9 A Stringing is a little
10 more difficult in that it does require people to be
11 out in the elements.

12 Q Did you make any assumptions
13 then as to extreme low temperatures at which these
14 activities could be carried out?

15 A Oh, in a general way
16 we thought the minus 35 degrees is probably about the
17 limit that people can work for any reasonable period in
18 the element. It depends on the wind conditions as
19 well as the temperature, Mr. Lucas.

20 Q And you had information
21 on the number of days that the temperature has
22 been minus 35 or lower in this particular region over
23 the past few years?

24 A We have a climatological
25 report, Mr. Lucas. I am pretty sure that that information
26 is in it.

27 Q Well, what I want to know
28 is whether this information was built into your
29 construction schedule?

30 A Yes, sir.

Dau, O'Rourke, Williams
Cross-Exam by Lucas

1 Q Okay, Mr. Williams,
2 we have got down to the first of April and spread C
3 is getting near its goal and let's assume for the
4 sake of the question I propose to ask that it achieves
5 its goal, 81 miles. Now, the bar graph indicates
6 that demobilization takes place following the completion
7 of spread C's work. Now, how long will this take and
8 what does this involve? Perhaps you can explain
9 what it involves first.

10 A That would be
11 mainly moving the camp and equipment to a wharf and
12 stockpile site on the river so that it can be
13 barged out for the next winter's operation. Flying
14 the men to their homes, that sort of thing.

15 Q How long will it take?

16 A In the case of spread
17 C the camp and equipment ends up at compressor station
18 MO-09 at m.p. 400, the nearest wharf and stockpile
19 site is about 20 to 25 miles north at river m.p. 565,
20 the bar chart suggests that this operation can take
21 up to two months.

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Dau, O'Rourke, Williams
Cross-Exam by Lucas

1 The construction plan as
2 filed is based on the understanding that the Mackenzie
3 Highway would be completed to Fort Good Hope before
4 construction of this project began, and that would
5 certainly influence, if that did occur that would
6 influence the mobility.

7 Q You say this graph was
8 prepared on that assumption?

9 A Our construction plan
10 as filed in March, 1973, March 1974, was based on
11 the assumption that the Mackenzie Highway would be
12 completed to Fort Good Hope, yes sir.

13 Q And if it's not completed
14 then are you suggesting that this process of demobili-
15 zation would take longer than is indicated in the
16 bar graph?

17 A Not necessarily, but
18 there would be less of a crunch to get that equipment
19 and material in camp out for barging down the river
20 the following summer.

21 Q Mr. Williams, as I
22 read this bar graph, it suggests that demobilization
23 could take until the end of April; or to put it
24 another way, until the 1st of May. Is that correct?

25 A Yes sir.

26 Q Are your snow roads
27 going to be usable at that stage?

28 A Probably not.

29 Q So that in fact the
30 heavy equipment and materials and so on would have

Dau, O'Rourke, Williams
Cross-Exam by Lucas

1 to be out somewhat before the end of April, is that
2 correct?

3 A In an average season
4 I would think so, yes.

5 Q Would you anticipate
6 perhaps a little bit of a crunch in the event that the
7 highway is not available to you for this spread?

8 A That's a possibility.

9 Q Mr. Williams, are you
10 aware of the usual cut-off time for land use activities
11 in permits that are granted under the Territorial
12 Land Use Regulations for activities in the Fort Norman-
13 Norman Wells area?

14 A Yes, I've certainly
15 read their regulations. I don't know them verbatim but
16 I have read them.

17 Q Would April 10th sound
18 like a number you've heard?

19 MR. GENEST: Well, if MR.
20 Lucas has the dates, why doesn't he stop playing games?

21 MR. LUCAS: I am suggesting
22 that April 10th has been used as a rule of thumb by
23 the administrators of the Territorial Land Use
24 Regulations in issuing permits for activities in the
25 Fort Norman-Norman Wells area. You were aware of that?

26 A I'm sure I've read it,
27 Mr. Lucas.

28 Q And yet your bar graph
29 suggests that some of your activities are likely to
30 continue until the end of April in this area.

Dau, O'Rourke, Williams
Cross-Exam by Lucas

1 A Yes. Moving
2 people out could extend into that area, certainly
3 every effort would be made to move the equipment out
4 and the equipment -- the spread doesn't all finish
5 on the same day, Mr. Lucas. Some operations finish
6 earlier than others, and as that equipment became
7 free, it would be moved to the wharf site, and the
8 rest of it would be moved as quickly as possible. If
9 we got stuck, then other arrangements would have to
10 be made.

11 Q With the relevant
12 regulatory officials, is that right?

13 A No, I don't think so.
14 For instance, if the snow road is of the quality we're
15 talking about it's quite likely it will stand up
16 longer than the normal operations that the Land Use
17 Regulations are geared to. If the road does go to
18 pot, and we can't move it out at the end of the second
19 construction year, we do have other surplus camp
20 equipment that could be used, and we might be forced
21 with leaving some of it there. Then again, the
22 highway might be there, too.

23 THE COMMISSIONER: The
24 Mackenzie Highway?

25 A Yes sir.

26 THE COMMISSIONER: Well, I
27 think that we'll adjourn until two o'clock. We'll
28 resume at two o'clock this afternoon.

29 (PROCEEDINGS ADJOURNED TO 2 P.M.)
30

Dau, O'Rourke, Williams
Cross- exam by Lucas

1 (PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)

2 MR. LUCAS:

3 Q Mr. Commissioner, I would
4 like to continue. The break occurred precisely at the
5 point that I had proposed to reluctantly part with
6 spread C in the second winter so I will move on.

7 Mr. Dau, in developing your
8 construction plan, and your construction schedule,
9 have you drawn on the construction experience to
10 date in Alaska on the Alyeska Oil Pipeline?

11 WITNESS DAU:

12 A No.

13 Q You have received no
14 useful information or experience at all from Alaska?

15 A No, the construction
16 plan that we filed was developed some time ago prior
17 to any construction on the Alyeska project.

18 Q Are you keeping an eye on
19 what is happening in Alaska with a view to review or
20 refinement of your construction plan?

21 A There are observers
22 in Alaska, yes. Observers from Canadian Arctic Gas.

23 Q Would you agree, Mr.
24 Dau, that while the pipelines are different, an oil
25 line in Alaska and a gas line of course here,
26 nevertheless, many of the Arctic construction techniques
27 that you proposed are basically similar to techniques
28 that will be used in Alaska?

29 A That the Alyeska techniques
30 are similar to our techniques --

1 Q Yes. Is that what you are
2 proposing? A

3 No, I think that **they** are quite different.

4 Q Could you explain?

5 A Yes, it relates of course
6 to the fact that it is a warm oil pipeline and they
7 do not propose to bury it in thaw unstable permafrost,
8 and they have, I believe it is essentially half
9 of their pipeline is installed above ground.

10 Q Would there be similar
11 considerations involved in things like grading in
12 ice rich soil areas and filling and perhaps the
13 use of snow roads?

14 A There would be similar
15 considerations in some of the earthwork, certainly.
16 I am not aware of Alyeska proposing the use of
17 snow roads. They may have, I am just not aware
18 of it.

19 Q And in addition would there
20 be logistical considerations -- perhaps Mr. O'Rourke could
21 deal with this -- would there be logistical considerations
22 that might have relevance to your plan here in
23 Alaska?

24 WITNESS O'ROURKE:

25 A Okay, the Alyeska people
26 had delivered a fair amount of their material requirements
27 to Prudhoe Bay via the Bering Sea route and the
28 procedure that has been used in that instance would
29 be followed to a large extent by Arctic Gas if they chose
30 to have their materials delivered along the Arctic

1 coastline via the Berring Sea route.

2 Q So it all depends on
3 whether you decide to do it that way?

4 A That is part of it,
5 the procedure itself is pretty well defined. It is
6 just a case of whether it would be the one that is
7 chosen.

8 Q And you have not made
9 that decision yet?

10 A No, sir.

11 Q Mr. Dau, will detailed
12 design and construction stipulations be incorporated
13 in construction contracts that go to tender?

14 WITNESS DAU:

15 A Yes.
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Dau, O'Rourke, Williams
Cross-Exam by Lucas

1 Q Will these stipulations
2 include detailed environmental and social stipulations
3 that are site-specific in nature?

4 A We haven't got
5 that far in the details. I am pretty confident they
6 would. I can't give you an example, for instance.

7 Q Well, I'd like to quote
8 to you a statement contained in the application of
9 Alaskan Arctic Gas Limited, which I believe has some
10 connection with the applicant here.

11 A Yes.

12 Q I'm having a little
13 difficulty --

14 THE COMMISSIONER: The
15 application to the Federal Power Commission or what?

16 MR. LUCAS: Yes. I'm having
17 a little difficulty, Mr. Commissioner, identifying
18 the exact location. Section B, "Monitoring and
19 preventive measures," and on page 4 the statement is:

20 "Measures for environmental protection form
21 a part of the pipeline design and will be
22 written into construction specifications."

23 Now, is similar action planned on the Canadian side?

24 A That's a matter for
25 Arctic Gas, but we would certainly recommend it, yes.

26 Q And you have made that
27 recommendation to Arctic Gas?

28 A Not as a specific
29 recommendation, I can't recall.

30 Q But you're going to do

Dau, O'Rourke, Williams
Cross-Exam by Lucas

1 so?

2 A Yes, certainly.

3 Q Now, these environmental
4 stipulations, my question was in terms of site specific
5 environmental stipulations, now would you anticipate
6 the stipulations that are written into contracts to
7 contain that degree of detail? I'm asking whether
8 that was your recommendation?

9 MR. MARSHALL: I'm sorry,
10 Mr. Lucas, I'm not sure what level of detail you
11 were talking about. That which was quoted in the
12 Alaskan Arctic application?

13 MR. LUCAS: What I'm asking
14 really, Mr. Dau, is whether these environmental
15 stipulations that are included in the construction
16 contracts will be merely general in nature, that is
17 the contractor will take care to avoid undue environ-
18 mental damage period, or whether they will be specific
19 in nature and deal with particular environmental
20 concerns at particular locations along the proposed
21 line.

22 MR. MARSHALL: I think I
23 understand the point you're interested in, Mr. Lucas;
24 Mr. Dau can speak of recommendations but he can't
25 say what Arctic Gas will have incorporated into its
26 contracts because that's a matter that his client
27 will determine. There will be others coming who will,
28 I am sure, speak to that, though.

29 MR. LUCAS: Well, Mr. Marshall,
30 you must have missed the fact that we were dealing

Dau, O'Rourke, Williams
CrossExam by Lucas

with this in terms of recommendations by N.E.S. I would like Mr. Dau to answer the question if he can.

THE COMMISSIONER: I think, Mr. Marshall, Mr. Dau can indicate whether that recommendation was made. We don't want to interfere with the relationship between Arctic Gas and Northern Engineering Services, but if the recommendation was made by N.E.S. it would be because in their professional judgment that was sound, and I think we should know about that.

MR. MARSHALL : I agree with that, sir.

A You first referred to a very general type of statement. It would go beyond that, obviously. As to the exact amount of detail, I'm sorry I can't respond to it. We have not gone into that amount of detail at this stage.

MR. LUCAS: Well, I'm interested in whether in your recommendation it would include -- these stipulations would include seasonal environmental sensitivities in particular areas, I'm thinking of snow geese staging in a particular area, fish over-wintering, caribou calving and so on.

A Yes, that type of thing would be included because it forms part of our construction plan.

Q But you haven't given it full consideration yet.

A No, we have not prepared the specifications for the contractor as yet.

Q But you plan to?

Dau, O'Rourke, Williams
Cross-Exam by Lucas

1 A Yes.

2 Q When?

3 A I would think it's more
4 than a year away.

5 MR. MARSHALL: That to some
6 extent depends on when you finish, Mr. Lucas.

7 MR. LUCAS: Just a minute now
8 Mr. Marshall.

9 Q Would that process take
10 place following the granting of the basic regulatory
11 approval that you referred to this morning?

12 A Most of it would take
13 place after that. I'm sure there would be some worked
14 out prior to that.

15 Q Including the grant of
16 the right-of-way permit from Indian & Northern Affairs?

17 A I don't quite understand.

18 Q Well, that being one of
19 the basic regulatory approvals that we referred to.

20 A Yes.

21 Q And the certificate of
22 public convenience and necessity from the National
23 Energy Board.

24 A Yes.

1 MR. MARSHALL: Just so we are
2 clear, Mr. Lucas and you are not mislead on this
3 point, we are speaking of what recommendations N.E.S.
4 might advance, there is as well the environmental
5 staff at Arctic Gas who may have some work in this
6 area as well.

7 MR. LUCAS: Are you suggesting,
8 Mr. Marshall, that there may be some evidence on
9 this subject lead through Mr. Horte?

10 MR. MARSHALL: Well, there
11 is to be an environmental phase at which time we had
12 intended to lead evidence through each of the various
13 disciplines in the environmental staff at Arctic
14 Gas and I should think we would get into this area
15 as well.

16 MR. LUCAS: Mr. Marshall,
17 these are aspects of construction that are very
18 highly relevant to the construction plan as I am
19 sure Mr. Dau would agree. Mr. Dau?

20 A Yes?

21 Q These considerations --

22 MR. SCOTT: I presume, Mr.
23 Commissioner, that we are not taking a poll on whether
24 the question is appropriate. I think that if there
25 is an objection to it that my friend should respond
26 to it.

27 MR. MARSHALL: Well, I think
28 that he has got an answer, sir.

29 THE COMMISSIONER: Yes, well,
30 one of the things that you learn as a presiding officer

Dau, O'Rourke, Williams
Cross-Exam by Lucas

1 in a court or in a hearing like this is that if you
2 do not say anything the objection may peter out and --
3 (LAUGHTER)

4 THE COMMISSIONER: -- and
5 that is a strategy that I have used often in the
6 past. Are you suggesting, Mr. Scott, that it is of
7 no avail in this instance?

8 MR. LUCAS: I am going to
9 proceed, Mr. Commissioner, that both the objection and
10 the question have been disposed of,

11 MR. MARSHALL: Just to make
12 it clear, sir, I was not making an objection. I was
13 pointing out to my friend that he not be mislead
14 that we are talking about a particular input, that being
15 N.E.S. in the form of a recommendation to Arctic Gas --
16 there are other aspects of it that will undoubtedly be
17 considered by Arctic Gas including the advice of its own
18 environmental staff and I just wanted to make sure that
19 Mr. Lucas understood that and was not being
20 mislead.

21 MR. LUCAS: Well, Mr.
22 Commissioner, I feel bound to explain that I had
23 it perfectly straight before Mr. Marshall spoke.

24 THE COMMISSIONER: Well --

25 MR. MARSHALL: If I have
26 succeeded in confusing you then perhaps it has not
27 all been lost.

28 THE COMMISSIONER: All right,
29 so we are under way again.

30 MR. LUCAS:

Dau, O'Rourke, Williams
Cross-Exam by Lucas

1 Q Mr. Dau, these environmental
2 stipulations in construction contracts, would it
3 be your recommendation that environmental consultants
4 be involved in the development of the specific stipulations
5 of this nature that would go into the contracts?

6 WITNESS DAU:

7 A Either the consultants or
8 the environmental staff of Arctic Gas, Yes.

9 Q Has any of that activity
10 by the environmental consultants taken place to date?

11 A In the preparation of
12 specifications?

13 Q Yes.

14 A No.

15 Q It is your recommendation
16 though that it will take place?

17 A Yes.

18 Q Should take place?

19 A Yes.

20 Q Mr. Dau, my understanding
21 is that a detailed design review is contemplated and
22 as I read the earlier evidence I had the distinct
23 impression that it would be handled by Northern
24 Engineering, they are really two questions, is a
25 detailed design review contemplated, first?

26 A I do not quite understand,
27 a detailed design review --

28 Q Yes,

29 A -- by Canadian Arctic
30 Gas?

Dau, O'Rourke, Williams.
Cross-Exam by Lucas

1 Q Yes.

2 A That is an ongoing process.
3 Yes, there will be a detailed design review.

4 Q But it is an ongoing
5 process and is it really part of the design process
6 for which Northern Engineering has responsibility?

7 A Yes, I believe so,
8 yes.

9 Q There is no contemplation
10 to your knowledge that a design review by an independent
11 authority such as a governmental authority will be
12 carried out?

13 MR. MARSHALL: Well, Mr.
14 Dau cannot speak for that. Surely what the Government
15 is contemplating and so on is something that this
16 witness cannot speak to.

17 MR. LUCAS: Mr. Commissioner,
18 my question is whether Mr. Dau, in developing his
19 construction plan schedule has contemplated the
20 possibility of a design review of this nature.
21 I think he can respond to that.

22 THE COMMISSIONER: You mean
23 a design review by the Government?

24 MR. LUCAS: By the Government or
25 perhaps by some other independent agency -- for example,
26 a firm of independent consultants outside Arctic
27 Gas and outside N.E.S. --

28 THE COMMISSIONER: Retained by
29 Arctic Gas.

30 MR. LUCAS: Retained by Arctic

1 Gas,

2 THE COMMISSIONER: Not an un-
3 usual procedure, I would think, at any rate, what
4 do you say, Mr. Dau?

5 A We had not contemplated
6 that.

7 MR. LUCAS:

8 Q Are you aware of the design
9 review process that has been imposed for the construction
10 of the Alyeska Pipeline in Alaska?

11 A In a very general way, yes.

12 Q And you do not contem-
13 plate a design review procedure of that nature being
14 developed or imposed in the case of this pipeline.

Dau, O'Rourke, Williams
Cross-Exam by Lucas

1 A By the client?

2 By Arctic Gas?

3 Q Either by the client or
4 by the Government of Canada.

5 MR. MARSHALL: Well, sir, it
6 seems to me that any of us may contemplate all sorts
7 of possibilities. We can deal with things that he
8 knows; we can deal with things that he has recommended.
9 Surely the contemplation or speculation of Mr. Dau or
10 any of us is not going to help very much.

11 THE COMMISSIONER: Well, Mr.
12 Lucas, it seems Mr. Dau didn't take this into account.
13 Is there any point in pressing it further?

14 Q Mr. Dau, I understand
15 that on the Peace River hydro project when the Bennett
16 Dam was built, a group of very distinguished engineers
17 of world-wide renown were assembled and acted as a
18 review panel, and presumably it was B.C. Hydro that
19 retained them, so to speak to review the -- all the
20 design problems as they went along. Was that unique
21 to that project?

22 A It's my understanding,
23 sir, that that is not an unusual circumstance for
24 that type of a project. I have read of such design
25 review teams on other large dam projects, for instance.
26 I should clear up some confusion, perhaps, on this
27 review that we're talking about, a design review in
28 the normal pipeline project. The designs do have to
29 be reviewed by the National Energy Board, before
30 you can construct, that you obtain leave to construct,

Dau, O'Rourke, Williams
Cross-Exam by Lucas

1 you submit to the National Energy Board the plan,
2 profile, and book of reference which does include a
3 lot of design information.

4 MR. LUCAS: And you're talking
5 about the notice to proceed procedure under the National
6 Energy Board Act?

7 A That's right.

8 Q And you've taken the
9 necessity for that process into account --

10 A Yes.

11 Q -- and built that time
12 into your construction schedule.

13 A Yes, we have.

14 Q Mr. Dau, just to return
15 for a moment to environmental stipulations in construc-
16 tion contracts, how is it planned that these environ-
17 mental stipulations will be fully complied with by
18 contractors? Have you made any recommendations with
19 respect to that matter?

20 A We have not made any
21 formal recommendations in that area. We have had
22 several conversations with Arctic Gas staff and it's
23 my view that the control of the contractors' work
24 has to rest within the client group. In other words,
25 Arctic Gas has to have the right to stop work under
26 some circumstances.

27 Q In considering this
28 problem of contractor control, is it contemplated that
29 the environmental stipulations in the construc_tion
30 contracts will be displayed, I guess is the word,

Dau, O'Rourke, Williams
Cross-Exam by Lucas

1 in the -- in an environmental atlas form? I am thinking
2 particularly, Mr. Dau, of the environmental assessment
3 atlas that was prepared through Bechtel Corporation
4 for Alyeska, and is used as a guide by contractors
5 in interpreting the contractual stipulations, is any-
6 thing of that nature contemplated?

7 A I don't know, sir. I'm
8 not familiar with that document.

9 Q I hadn't realized that
10 was such a significant answer.

11 THE COMMISSIONER: Is anyone
12 going to ask for an adjournment?

13 MR. LUCAS: How then, Mr.
14 Dau, will the nature of these stipulations be communi-
15 cated to the contractors and their responsibilities
16 with respect to these stipulations be made known?

17 MR. MARSHALL: Well, Mr.
18 Lucas, I hate to be a pest, but he's indicated that
19 this is something that Arctic Gas will be doing and
20 they haven't yet got to that point of having issued
21 such stipulations, and I don't know how he can say
22 how they're going to do it when he's not the one who
23 is going to do it. They are the one that's going to
24 do it and they haven't yet done it.

25 MR. LUCAS: He seems to have
26 made recommendations, with respect, on many of these
27 issues, and these are certainly matters that would
28 have to be taken into account in developing a con-
29 struction plan and schedule.

30 Q Is the answer, Mr. Dau,

Dau, O'Rourke, Williams
Cross-Exam by Lucas

1 that it simply hasn't been contemplated and it hasn't
2 been taken into consideration in developing the
3 schedule?

4 A The development of
5 some environmental stipulations has not been taken
6 into account in developing the construction schedule?

7 Q And the rendering of
8 these environmental stipulations into map form, into
9 detailed map form so that they can be easily inter-
10 preted by the contractor.

11 MR. MARSHALL: Sir, I object
12 to that question.

13 THE COMMISSIONER: Well, I
14 think, Mr. Lucas, all you can ask Mr. Dau is whether
15 he made such a recommendation, and it seems obvious
16 he didn't. Why don't you leave that matter and take
17 it up with Mr. Horte in his panel next week? He
18 represents Arctic Gas. He's in a position to indicate
19 what measures they contemplate to ensure their
20 contractors live up to environmental standards, and
21 why take it one step further back to the engineers
22 and say to them, "Now, what recommendations have you
23 made?" Is this getting us anywhere?

24 MR. LUCAS: Well, Mr. Commis-
25 sioner, one of the reasons why I'm pushing this perhaps
26 a little further than I ought is that while there
27 has been considerable talk about Mr. Horte appearing
28 next week and speaking to a number of things, I haven't
29 seen, and I don't believe any of the other parties
30 here have yet seen a summary or transcript of the

Dau, O'Rourke, Williams
Cross-Exam by Lucas

1 evidence proposed to be led, and until we do I'm really
2 not very certain whether Mr. Horte is going to cover
3 the matters that we are considering right now, and
4 without that assurance --

5 THE COMMISSIONER: Well, excuse
6 me, I'm not certain that he's going to either. I
7 am in a state of uncertainty. What I'm saying is
8 that if, ^{you} getting up to cross-examine him, want to put
9 this question, there seems to me to be no basis upon
10 which an objection can be made to it. That's -- and
11 if he's in a state of complete ignorance of the sub-
12 ject, I don't mean ignorance in any derogatory sense
13 but it hasn't been considered, if there are no plans
14 to consider it then that's something that you and the
15 Canadian Arctic Resources Committee can call evidence
16 about, make submissions about and so forth. But I
17 think this is a dry well here with Mr. Dau, who is
18 co-operative and esteemable in all respects, but he
19 says he doesn't know anything about this.

20 MR. LUCAS: Can I assume then,
21 Mr. Commissioner, that Mr. Horte is on notice and will
22 be well-prepared to speak to this subject, and will
23 not be deferring the matter to subsequent panels?

24 THE COMMISSIONER: Well, I
25 should think that that's a fair assumption, isn't it,
26 Mr. Marshall? Can we put that to you?

27 MR. MARSHALL: I think it's
28 clear that we understand, after the last few moments'
29 comments from my learned friend, that he wishes to
30 hear something from Mr. Horte on this, and undoubtedly

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1 Mr. Lucas will put the question. Whether -- I don't
2 think I can go beyond that. I will certainly tell Mr.
3 Horte that Mr. Lucas is interested in this area.

4 MR. SCOTT: There's not need,
5 Mr. Commissioner, if Mr. Horte for some reason isn't
6 able to answer it, he will be brought back at a
7 convenient time so that he is. I mean I intend, and
8 I'm sure others do, intend to ask him a series of
9 questions that he doesn't expect to talk about. That's
10 what cross examination is in aid of.

11 MR. MARSHALL: I could
12 express some surprise at that, sir, but I'll let it
13 pass.

14 No, I think just on this
15 point, sir, it's clear that there is no way that one
16 can anticipate all of those areas that my friends
17 might be interested in going into with Mr. Horte, and
18 indeed areas will be coming up right until the moment
19 the O. & M. panel finishes and Mr. Horte gets onto the
20 stand, and I don't think that there is really anything
21 we can do about that. We appreciate that Mr. Lucas
22 is interested in this area. We will advise Mr. Horte
23 and we will leave it to Mr. Lucas to raise his question.

24 THE COMMISSIONER: Well, I
25 think that that's fairly clear, Mr. Lucas. I don't
26 see any point in your pursuing this matter with Mr.
27 Dau.

28 MR. LUCAS: I think I'm perhaps
29 inclined to agree with you, Mr. Commissioner. That
30 means that perhaps the bulk of the remainder of the

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Cross-Exam by Lucas

1 questions that I had are better addressed to Mr. Horte
2 and whoever else he brings with him.

3 THE COMMISSIONER: You're
4 really now getting into the whole governance of the
5 project in a sense, aren't you?

6 MR LUCAS: But I also want to
7 drive home the point, Mr. Commissioner, that all these
8 things which are essentially a matter of Arctic Gas
9 policy, depend on very important aspects of the
10 construction plan and schedule. I want to make that
11 connection very clear, and if these witnesses can take
12 us no further on that, then I'm sure you right then and
13 I must move to the Horte panel.

14 There is one thing, though,
15 that I would like to reiterate, and that is this
16 matter of a summary of evidence for the Horte panel.
17 That complaint that I made a few moments ago was
18 lost in Mr. Marshall's response, and we still haven't
19 had a summary of evidence and in fact I don't know,
20 for one, if the Horte panel will consist of Mr. Horte
21 alone or whether he will be supported by other witnesses
22 and who they will be, and I wonder if Mr. Marshall
23 could perhaps enlighten us as soon as possible on this
24 matter?

25 THE COMMISSIONER: That seems
26 a fair request. Can you say anything about that now,
27 or would you prefer to respond tomorrow or even Friday?
28
29
30

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Cross-Exam by Lucas

1 MR. MARSHALL: Perhaps I could
2 respond after the coffee break this afternoon, sir.

3 MR. LUCAS: In that case,
4 Mr. Commissioner, those are all the questions that I
5 have.

6 THE COMMISSIONER: I think
7 you should add at this time -- I take it that those
8 are all the questions that you have at this time. I
9 think that if when you have an expert coming up
10 to assist you and it turns out you overlooked something
11 you can go after that when Mr. Scott has finished
12 his questioning.

13 MR. LUCAS: Yes, thank you,
14 Mr. Commissioner, there may be a few additional
15 questions.

16 MR. SCOTT: With your permission,
17 Mr. Commissioner, Mr. Goudge and I divided our questions
18 in two parts and he will go first if that is all right
19 and I will follow up.

20 MR. GOUDGE: Before I begin,
21 Mr. Commissioner, last week or two weeks ago when
22 we were here you instructed me to inform the Association
23 of Municipalities and the chambers of commerce about
24 certain matters that had gone on with this panel.
25 I did so and Mr. Reesor is here for the Association
26 of Municipalities and I think -- would like, if he could,
27 to address just a few remarks to you in connection
28 with what you asked me to tell him.

29 MR. REESOR: Mr. Commissioner,
30

1 I would like to take this opportunity to respond to
2 your remarks and advice to the Association of
3 Municipalities that perhaps we might be interested
4 and coming and addressing a few questions to the
5 construction panel. I thank you for this. Sometimes
6 because of our inactivity at the early stages of
7 the hearing we think that maybe we are being forgotten
8 and --

9 THE COMMISSIONER: No one is
10 being forgotten.

11 MR. REESOR: Very good.
12 In light of that, I had a-- had discussions with my
13 executive committee on April the 24th in Inuvik and
14 recently with Mr. Sigler, our counsel the results of
15 these discussions were in a nutshell that we had
16 no questions at this time, but I felt that it would
17 be of interest if I generally outlined our thinking
18 as to overall strategy down the road.

19 The first consideration in
20 this decision was that we felt that our involvement
21 was such that it would be difficult to prepare properly
22 at this time in the construction phase that we are
23 somewhat out of our area of expertise and we might
24 find ourselves lacking and that we may regret later
25 on in the fourth phase from a credibility point of
26 view and so on.

27 The second consideration was
28 that we felt that the fourth phase would concern
29 itself with all of our concerns in some depth and
30 certainly each phase is not a water tight compartment and

1 we can probably look at some overlap somewhat in the
2 construction area as well as in the environmental
3 area and so on as far as it touches people in the
4 north.

5 An additional matter is that
6 we felt that because of the funding which -- that we
7 have, we felt it would probably be more
8 effective to allocate it pretty well to the fourth
9 phase so that we can put on our show then and not
10 sort of dribble it throughout the hearing, so to
11 speak.

12 MR.GOUDGE: To the way
13 the rest of us are.

14 MR. REESOR: Right.

15 So I felt that our original
16 plan of action in this was most appropriate, however,
17 in the first three phases or however it works out that
18 we will not be actively involved. We are reviewing
19 the transcript on an ongoing basis, flagging the items that
20 are of concern to us so we can bring them up in the
21 fourth phase. And the second thing is in light of
22 Mr. Sigler's comments during the first couple of days,
23 during the overview section of the hearings was the
24 stress on the community hearings and I will be
25 actively involved at the community hearings which are
26 held in the communities that are members of our
27 Association in actively assisting them putting together
28 their submission as well as questions that will probably
29 get into the sort of area that we are into now.
30 I think that the format that was discussed for the

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1 community hearings in Professor Jackson's committee
2 will be satisfactory in allowing questions to gain
3 further information for our purposes and in addition
4 this would allow the local people to gain an under-
5 standing of what is going on in each of these areas
6 since a lot of these matters of logistics, control,
7 scheduling and so on are fairly site specific and
8 I think it is as we have seen in some areas it is
9 difficult to generalize overall so this would be
10 of assistance to the local councils for our purposes
11 so that in summary I suppose, even though it is not
12 the best possible deal, the best possible solution
13 over all within the resources at our command we
14 feel that this is probably the best route to go.
15 Thank you.

16 THE COMMISSIONER: Thank you,
17 Mr. Reesor. I know that sounds very, very sensible and
18 I am sure it will be helpful to your organization
19 and the Inquiry for you to proceed in that way. I certainly
20 respect your judgment regarding the extent to which
21 you wish to participate and I am pleased that you
22 are flagging the things that are of concern to you
23 as you look at the transcript, so thanks very much
24 for coming along.

25 MR. REESOR: Thank you.

26 MR. GOUDGE: Mr. Commissioner,
27 I should indicate that I indicated your invitation
28 to Mr. Sigler on behalf of the Chambers of Commerce
29 as well and he indicated that he thought it unlikely
30 he would take advantage of your invitation.

1 CROSS-EXAMINATION BY MR. GOUDGE:

2 Q Mr. Dau, you were
3 asked this morning by my friend Mr. Lucas a little
4 about the width of the right-of-way that you propose.
5 No doubt on the schematic that you have given us it
6 shows 120 feet cleared wall to wall, so to speak.
7 I am a little curious as to the appearance of the
8 vehicles on the schematic, particularly the Arctic con-
9 struction right-of-way configuration, do you have
10 that in front of you?

11 MR. DAU

12 A Yes.

13 Q It shows two trucks on the
14 right hand side in the traffic lane, one going in either
15 direction. It take it those trucks would be part of
16 the stringing operation, that is what is represented
17 there.

18 A That is what is represented
19 there, yes.

20 Q And do you contemplate the
21 trucks outward bound containing two 80 foot lengths
22 of pipe, is that what that indicates on the right-
23 hand side or is that simply an approximate representation?

24 A I would call that an
25 approximate representation.

26 Q Has any decision been made
27 as to whether you intend to truck in two or three
28 length loads?

29 A No, I think not. It
30 would be site specific in a particular area. It would

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Cross-Exam by Goudge

1 depend on the -- obviously the grades and the hills
2 and whether we had 40-foot pipe or 60-foot pipe or
3 double joint 80-foot pipe.

4 Q Normally it would
5 be 80-foot lengths, I think?

6 A Normally. There are
7 areas that there would be 60-foot pipe.

8 Q Yes, the inbound truck
9 facing us is obviously empty in that schematic?

10 A It appears so --

11 Q Moving over to the
12 left hand side the workings--

13 THE COMMISSIONER: Excuse me,
14 what page is this on, Mr. Goudge?

15 MR. GOUDGE: I am sorry, sir,
16 it is a schematic that was handed out and formed an
17 exhibit. I do not have the exhibit number, but I
18 think I know what is on it if you would like to
19 look at my copy.

20 THE COMMISSIONER: Thank you.

21 MR. GOUDGE:

22 Q Now, the working surface
23 there shows two side booms side by side. I
24 take it that there are perhaps one or two phases of
25 the actual construction process where that would occur,
26 but no more than one or two? It is not normal practice
27 to run side booms side by side?

28 A No. This is a schematic,
29 sir. It indicates some dimensions.

30 Q It has nicely filled up all

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Cross-Exam by Goudge

1 the travelling lanes.

2 A Yes, it has.

3 Q I take it --

4 A They are probably some of
5 the widest units I think was the purpose.

6 Q It is rush hour.

7 A I beg your pardon?

8 Q It is rush hour.

9 A Yes.

10 Q I take it is not normal
11 practice for the side booms to appear cheek by jowl
12 like that, that the normal practice would be to have
13 them one behind the other, freeing up the travelling
14 lane?

15 A That would be normal, sir.

16 Q Yes, and I take it except
17 for instances of passages back and forth or instances
18 of trucks passing one another it would be normal
19 to have one lane of the traffic lanes on the right-
20 hand side empty?

21 A I am sorry, I did not
22 quite get that.

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Cross-Exam by Goudge

1 Q It's not the normal
2 occurrence to have trucks at the same point on the
3 traffic lane passing each other.

4 A That's correct, sir, yes.

5 Q You said this morning
6 that you thought you would have grave difficulty
7 reducing the number of working lanes from four to any
8 lower number. Did I understand you correctly?

9 A Yes. It would
10 be much less efficient, in my view.

11 Q But not impossible?

12 A Not impossible, of course
13 not, but it would be much less efficient. It would
14 --

15 Q Could you elaborate on
16 that, or have you given thought to it to do so?

17 A No, we have really not
18 investigated a narrower right-of-way in a great amount
19 of detail. This shows the traffic lane, the snow
20 road on the 120-foot right-of-way. There are instances
21 of course, depending on terrain, when that road may
22 in fact not be on the right-of-way. I'm referring
23 to a crossing of river valleys or creek valleys, for
24 instance, where it may be necessary that the snow
25 road be some distance away from the actual pipeline
26 right-of-way.

27 Q In that circumstance,
28 is your contemplation to clear the full width of the
29 120-foot proposed right-of-way?

30 A No, we would not do it

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Cross-Exam by Goudge

1 in that event.

2 Q In that circumstance you
3 would clear 30 feet less than is shown on the config-
4 uration that I'm referring to.

5 A And the other point, of
6 course, is that the stripped organic layer, where
7 applicable on this illustration utilizes ten feet. If
8 that was not done why obviously that would not be
9 cleared either.

10 Q Let me come to that then.
11 You said, I think, yesterday that you have on-going
12 research to determine the necessity of carefully
13 storing your organic layer for re-covering purposes.
14 Did I understand it?

15 A Yes.

16 Q If your research shows
17 that that's not necessary, are you telling us that
18 you will not need to clear that ten feet of right-of-
19 way?

20 A That's right.

21 Q I take it you will also
22 not need to clear that ten feet of right-of-way when
23 you're using the conventional construction method.

24 A That's correct.

25 Q Yes. Now getting back
26 to the original question, if I may, could you operate
27 with a three-lane right-of-way on the right-hand side
28 of the ditch?

29 A Yes, I'm sure you could.

30 Q Could you give any esti-

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Cross-Exam by Goudge

1 mation of what that would do to your construction
2 schedule, if anything? Or is that a question that
3 would require more research than you've had time to
4 give?

5 A We would certainly want
6 to investigate it a little further before answering
off the cuff, so to speak.

7 Mr. Williams,
8 Q / You look like you're
9 thinking hard. Can you help me on that?

10 WITNESS WILLIAMS: Just to
11 reiterate that in my opinion also, it would not be an
12 efficient operation to work in that type of restric-
13 tion.

14 Q Could you quantify the
15 loss of efficiency in percentage terms?

16 A No sir.

17 Q Do you, Mr. Dau, have
18 any knowledge of the usual right-of-way cleared for
19 the major big-inch Trans-Canada construction projects?
20 Is it 120 feet?

21 WITNESS DAU: Not on the
22 average, no sir, I'm sure it's much less than that.
23 I'm sorry, I don't have the number.

24 Q Using the same configura-
25 tion, and again asking you to bear with me, have you
26 made any ball park calculations as to what kind of
27 traffic in terms of vehicle passes would take place
28 at any point on the right-of-way during one of your
29 three major winter construction seasons?

30 WITNESS WILLIAMS:

A Yes, I have some numbers.
We tried to pick out a worst case for this situation

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Cross-Exam by Goudge

1 that you cite, Mr. Goudge, and we looked at a couple.
2 One is the work site -- with the work camp at Komakuk
3 Beach where the camp is on the beach and there's a
4 snow road access to the right-of-way, and then of
5 course the right-of-way. The estimated number of
6 passes on the snow road between the camp and the
7 right-of-way is 45,000.

8 Q Stopping there, Mr.
9 Williams, that's over what time span?

10 A Pardon me?

11 Q What time span? The
12 life of the project or the first construction season,
13 or what?

14 A This is the third con-
15 struction winter, it's one construction season.

16 Q One construction season,
17 thank you.

18 A And onto the right-of-
19 way that would be, the right-of-way of course goes
20 both directions and on the longest segment that would
21 have the most usage it would be about 29,000 passes.
22 We looked at another one at Old Crow on the right-of-
23 way adjacent to Milepost 335, and that was also, well,
24 29,700.
25
26
27
28
29
30

Dau, O'Rourke, Williams
Cross-Exam by Goudge

1 Q During one winter con-
2 struction season?

3 A Yes sir.

4 Q Now let me deal, Mr.
5 Dau, if I may, with you on the matter of surveying.
6 Your application, as I read it, indicated that there
7 would be five surveys. Your evidence, as I understood
8 it, indicated that there would be four. Am I under-
9 standing correctly? There was a control survey in
10 your application which does not appear in your
11 evidence.

12 WITNESS DAU: Yes, that's
13 correct.

14 Q You've replaced the
15 information you were to gather in the control survey
16 by another means, Is that correct?

17 A Yes.

18 Q Could you pronounce the
19 word rather than me? How are you proposing to
20 gather that information?

21 A Photogrametrically with
22 controls supplied by the Government of Canada.

23 Q Can you help me as to
24 why you chose to go to this method rather than the
25 control survey?

26 A It's much less costly,
27 Mr. Goudge. When we made the application we weren't
28 aware that the whole route, the control on the whole
29 route would be available from the government. In fact,
30 the part in the Yukon was just completed last summer.

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Cross-Exam by Goudge

1 So now the government has control data on the whole
2 route in the Northwest and Yukon Territories. It wasn't
3 available at the time of the application.

4 Q These are government
5 photographs?

6 A No sir, this would be
7 using our own photographs, utilizing the government
8 control system.

9 Q I see. So it's a
10 matter of economics.

11 A Yes sir.

12 Q That means then that
13 your first survey is the location survey.

14 A Yes sir.

15 Q The control procedure
16 you now propose does not require you to go onto the
17 land, it can all be done in the office.

18 A Yes sir. We're running
19 a test on 25 miles of this next month in the Fort
20 Good Hope area to prove out the system to our
21 entire satisfaction.

22 Q Is this your first
23 test with that system?

24 A It's the first by
25 Northern Engineering. It has been done by other
26 companies in other areas.

27 Q If the test does not
28 meet your satisfaction, what do you propose?

29 A Then we would have to
30 reconsider the control survey.

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Cross-Exam by Goudge

1 Q You would have to go
2 back to the control survey, is that correct?

3 A We would reconsider it
4 certainly. It would depend on what degree of control
5 we experience this coming summer.

6 Q The location survey, as
7 I read your construction schedule, at least as filed
8 before the filing was amended, is to begin in July of
9 1975. Is that so?

10 A The schedule as amended?

11 Q No sir, the application
12 as it was filed last March.

13 A Do you have a particular
14 area in mind?

15 Q What I was looking at
16 was page 28 of the relevant section of the application
17 which is 13.A.6.2, and the schedules that go with it.
18 Do you have the survey schedule in front of you, Mr.
19 Williams? Figure 1.

20 Q Yes sir.

21 Q I take it that that
22 shows July 1, '75 to March 31, '76, as best I can
23 decipher those.

24 A Except for the section
25 from Alaska-Yukon border to Travallaint Lake.

26 Q Yes.

27 A Yes sir.

28 Q And the purpose of the
29 survey, as I read it in the application, is to locate
30 the boundaries of all support facility sites and access

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Cross-Exam by Goudge

1 roads, and to complete the location of the pipeline
2 right-of-way between control points. You concur in
3 that?

That's on page 28 of the
4 section I cited. You better concur, Mr. Williams,
5 I'm reading verbatim from the application.

6 A Yes sir.

7 Q Now, carrying on in the
8 application, it sets out what I read to be basically
9 two methods of conducting this location survey. On
10 page 29 you refer to a sparse tree cover method and
11 thereafter a forested area method. Would you agree
12 with me that the application speaks of two kinds of
13 location survey method ?

14 A Yes sir.

15 Q And in the sparse tree
16 cover area method, the indicia are helicopter trans-
17 portation and summer work, basically, together with
18 hand clearing.

19 A Yes sir.

20 Q And the forested area
21 method is to be winter work with clearing by machine .

22 A Well, the first sentence,
23 Mr. Goudge, says it can be done in either winter or
24 summer. Generally winter would be used, and we should
25 add that we have done more thinking about this since
26 the application was written, and we have come to the
27 conclusion now that we would much prefer the location
28 work done in the summertime.

29 Q You would much prefer
30 the location work done in the summertime?

Dau, O'Rourke, Williams
Cross-Exam by Goudge

1 A Yes.

2 Q That means that in the
3 forested areas you would propose, where possible, to
4 do the location survey in the summertime.

5 A Yes sir.

6 Q Why is that?

7 A There are several
8 reasons. The winter survey has some advantages, the
9 ground is frozen, you could probably clear a cut line
10 with -- by machine. Transportation by snowmobile or
11 bombardier would be useful; but the big disadvantage
12 is that there can be a considerable amount of snow
13 on the ground and it is during the location period that
14 we plan to gain considerable information with respect
15 to drainage that could be covered and not seen in the
16 wintertime, the exposure of materials at stream crossing
17 banks, the outcrops, the actual probing for thawed
18 areas, running the geophysical instrumentation to
determine rock locations. All of these things can
20 be much better done in the summertime and
21 those are the main reasons that we have changed our
22 thinking in this respect.

23 Q Does that mean that your
24 current construction schedule calls for both types of
25 location surveys to be done in the first summer?

26 A It is our opinion that
27 that is the time it is best done.

28 Q And that's the time
29 your schedule calls for it, I take it, now.

30 A That would be our

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Cross-Exam by Goudge

1 recommendation to Arctic Gas.

2 Q Yes. Now, there is no
3 doubt that there are forested areas north of 60.

4 A No doubt at all.

5 Q As you use the defini-
6 tion, "forested area" in this part of the application.

7 A Yes sir.

8 Q That means, I take it,
9 that you now propose location surveys in the forested
10 areas north of 60 during the summer.

11 A Yes sir.

12 Q Yes. How are you proposing
13 to clear the cut line in the forested area?

14 A With a chain saw.

15 Q By hand?

16 A By hand, yes.

17 Q The entire clearing for
18 the survey is to be by hand?

19 A Yes sir.

20 Q I take it that's both
21 in the forested area and the sparse tree cover area.

22 A This is our recommenda-
23 tion.

24 Q So you now just have
25 basically the one method of location survey, hand-
26 clearing summer work.

27 A I should clarify a bit,
28 Mr. Goudge. I've been thinking in terms of the pipe-
29 line right-of-way. Some other facilities like borrow
30 sites where you might want to do drilling in the

Dau, O'Rourke, Williams
Cross-Exam by Goudge

1 wintertime, certainly winter survey in that case would
2 be adequate, and some of the other ancillary facilities.
3 But the pipeline route and particularly permanent
4 roads, things where drainage is of great importance,
5 is better done in the summertime.

6 Q Yes, and your proposed
7 plan then now calls for the entire location surveying
8 of the line north of 60 to be done in the summer with
9 hand-clearing.

10 A That will be our recommen-
11 dation to Canadian Arctic Gas.

12 Q Yes. Now, let's talk
13 if we can then a little about the crews that will
14 be necessary to do this function. Have you formed
15 an opinion as to the crew size for location survey
16 crews?

17 A Yes, ^{we} have a report, Mr.
18 Goudge, that is on that list of documents that explores
19 about six or seven different methods of achieving the
20 survey work at different times of year, different
21 crew sizes, different equipment. I've forgotten the
22 number in that plan that we would recommend going
23 with. It is certainly the summer one. The crew sizes
24 are also given in that report. I could dig it out and
25 --

26 Q Perhaps over coffee you
27 might have a look at it. Can you recall a ball park
28 number for crew sizes?

29 A It would be under 20,
30 I think.

Dau, O'Rourke, Williams
Cross-Exam by Goudge

1 Q Do you have a ball park
2 number for the number of crews?

3 A It would be at least
4 one per spread per season. The location work doesn't
5 have to all be done in one summer season. It may be
6 done that way, though, but --

7 Q Have you formed an
8 opinion as to whether it would be preferable to do
9 it all one summer, the first summer?

10 A There certainly are
11 advantages to having that information at the earliest
12 possible date. It does mean putting out money ahead
13 of time, that will be a decision of Arctic Gas. I
14 would think the number of crews would maybe peak out
15 at 10, something like that.

16 Q Ten crews north of 60
17 the first summer?

18 A That would -- some on
19 the pipeline location and some on ancillary work.
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Dau, O'Rourke, Williams.
Cross-Exam by Goudge

1 Q I see. A ball park
2 figure though would be 200 men engaged for the owner
3 in locations surveying the first summer?

4 A That is roughly it, yes.

5 Q Perhaps you could check
6 that over the break and if your report shows any
7 difference from that you could let me know after the
8 break.

9 A I would be glad to do
10 that.

11 Q Where will these men be housed?
12 Are they going to be housed in separate construction
13 camps?

14 A Along the Mackenzie
15 Valley the scheme that we like and prefer would be
16 to have the location crews camped on a barge supported
17 by helicopter that would take them into work, bring
18 them back at night, take them across stream crossings
19 that were not fordable, carry a small portable drill
20 rig to do a little extra work where it was thought
21 necessary and move the barge once or twice a week --
22 I am sorry, once a week or once every ten days maybe
23 to shorten the distance between the work site and
24 the camp. In the areas not on the Mackenzie, it
25 would be a separate camp proposition, yes.
26 Probably portable by helicopter.

27 Q And placed where?
28 Take the Fort Simpson amendment. For example.

29 A I guess the worst area
30 is between the Mackenzie crossing east of Fort Simpson

1 and the 60th parallel. They would be camped
2 probably beside a source of water for the camp at
3 convenient locations along the route.

4 Q There's no contemplation
5 of camping these men in any of the communities along
6 the Mackenzie?

7 A No, sir.

8 Q What width will the
9 cut line be in your location survey?

10 A The normal practice is
11 to clear it so that you can see all the way up
12 the cut line. It is called skylining, I think. And
13 would be at least four feet wide.

14 Q And up to on the
15 high side?

16 A Maximum width?

17 Q Yes.

18 A That depends on the
19 size of the trees, but I would not see it more
20 than seven or eight feet wide.

21 Q Now, going back for a
22 moment, Mr. Williams to your earlier answer that
23 there were some ancilliary facilities that might
24 have their location survey done in the wintertime.
25 I take it there in the forested areas at least
26 you would continue to propose machine clearing?

27 A That would be one
28 option. The problem would be to get the equipment
29 there and whether it is cheaper to haul in equipment
30 or haul in people and do it by hand. I think it would

1 be an economic situation, Mr. Goudge.

2 Q You have made no decision
3 though, I take it, to have all your location survey
4 clearing, even that in the winter, done by hand?

5 A No.

6 Q That means that there
7 are going to be some cases where location survey done
8 in the winter will be done -- is done in the winter and
9 the clearing will be machine done?

10 A We think that that is
11 an option available.

12 Q And it would not surprise
13 you if that came to pass?

14 A My personal opinion, I
15 would rather -- I recommend against it.

16 Q Why?

17 A The chances of damaging
18 the surface vegetation is certainly greater with
19 equipment than it is by hand. If you are exploring
20 a potential borrow site and it does not prove up
21 to your expectations and you had done machine
22 clearing, you would have more area cleared than
23 if it were done by hand.

24 Q So your personal
25 opinion is that all the clearing for
26 location survey, whenever done, ought to be done
27 by hand?

28 A That would be my recom-
29 mendation, yes.

30 Q Yes. Come, if we can, Mr.

Williams and I will continue with you unless you want to pass the ball to Mr. Dau to the subject of clearing generally. Not simply connected with surveying. Mr. Dau addressed that in his evidence in chief at page 4337, and I take it again from the application that clearing of the right-of-way will be done in the winter prior to construction. You did not say that, Mr. Dau, but the application says that, is that correct? The clearing of the right-of-way prior to construction?

WITNESS DAU: You are referring to the application?

Q I am referring to your proposed construction methodology.

WITNESS WILLIAMS: The 4437, is that the --

Q That is the transcript, yes.

There is no doubt about it, I take it, you are proposing that the clearing of the right-of-way is going to take place the winter prior to construction.

WITNESS DAU:

A I am sure that is right, sir, I cannot find it in the application right now, but --

Q Take my word for it.

A Yes, I will sir, yes.

Q Now, you will have to help me though with one of the items, or two of the

Dau, O'Rourke, Williams
Cross-Exam by Goudge

1 items of equipment that you propose using. You
2 referred, Mr. Dau, on that page of the transcript that
3 Mr. Carter put in front of you to bulldozers equipped
4 with V or roam type cutting blade attachments.
5 Could you describe both of those to me please. Remembering
6 that I am a layman. What is a V-type cutting blade?

7 WITNESS WILLIAMS:

8 A All right, the roam
9 type cutting blade is an attachment to the dozer blade
10 that is designed for clearing land or rights-of-
11 way.

12 Q What does it look like?

13 Can you describe it?

14 A I tried to described a back
15 hoe here a few weeks ago and I sure got into trouble.

16 Q I suppose you could say that
17 it doesn't look like a back hoe.

18 I just want to be able to
19 understand it .

20 WITNESS DAU:

21 A The best I can do is that
22 it is a V-type blade that has got a cutting edge on
23 the base.

24 Q Well, we will stop there
25 and ask what the roam type blade looks like.

26 A I personally do not know.

27 Q Do you know, Mr.

28 Williams?

29 WITNESS WILLIAMS:

30 A Not really, no.

1 Q Is there such a thing?
2 I would just like to understand.

3 WITNESS DAU:

4 A We will try and find
5 out for you, sir.

6 Q It would really be helpful
7 but my concern is the way in which it relates to use
8 on the land.

9 A We will try and find
10 some information for you, sir.

11 Q Yes, perhaps over the break
12 you might be able to get some assistance as to whether
13 there is one in captivity that we could have a
14 picture of or a description of.

15 MR. SCOTT: It may give us
16 as clue as to why Mr. Williams had difficulty explaining
17 what a back hoe was.

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Dau, O'Rourke, Williams
Cross-Exam by Goudge

1 THE COMMISSIONER: I think we'll
2 let Mr. Goudge make all the clever remarks during this
3 session, Mr. Scott.

4 (LAUGHTER)

5 MR. GOUDGE: It's a broad use
6 of the words "clever remarks".

7 Q Starting with these two
8 pipes then, Mr. Dau, is my next question one that gives
9 you pause, and that is can you compare them for me
10 in terms of their potential for disturbing the surface
11 layer?

12 WITNESS DAU: We will try and
13 get you that information, sir.

14 Q You have no idea whether
15 one or the other is better in that regard?

16 A No, I do not.

17 Q Leaving that for the
18 moment then, you've described in broad terms at least
19 in your evidence in chief the use of crews for clearing
20 the right-of-way. Again, do you have an estimate of
21 the size of crew? MR. MARSHALL:
22 Mr. Dau, if you look at response
23 No. 2 to the Assessment Group, there is a breakdown
24 given there that might help you.

25 MR. GOUDGE: If that includes
26 it, Mr. Marshall, I'd be glad if you put it in front
27 of Mr. Dau.

28 A Detailed planning in
29 spread G-3, H-3 -- that's G, third winter, H, third
30 winter -- B-1, C-1, and C-2 list 27.

Q A clearing crew of 27?

Dau, O'Rourke, Williams
Cross-Exam by Goudge

1 A In those particular
2 spreads.

3 Q Is that 27 in each
4 spread?

5 A Yes, in spreads D-2,
6 D-1, E-1, E-2, they're combined with a grading crew
7 and in those cases the totals are 67 for those spreads.

8 Q In each spread?

9 A Yes.

10 Q Would that be half and
11 half, half grading and half clearing, approximately?
12 I take it that that would be a fair ball park
13 estimate.

14 A Ball park, sir, yes.

15 Q We're talking 40 people
16 a crew and one crew a spread, is that -

17 A It was 67 total, sir.

18 Q 40 people for a clearing
19 crew, if I can break up your grading and clearing
20 crew.

21 A Yes, I'd have to get
22 the details but that's a ball park figure.

23 Q Yes, and one clearing
24 crew per spread?

25 A Yes. Spread F-2 totals
26 45.

27 Q Yes. Now, are these
28 clearing crews housed separately?

29 A They would be housed
30 separately for -- separately from the main pipeline

Dau, O'Rourke, Williams
Cross-Exam by Goudge

1 construction camp for summer operations in all pro-
2 bability.

3 Q Well, they're a year
4 ahead of construction.

5 A Yes, it would be a smaller
6 camp in that instance. On spreads where they are not
7 a year ahead, it was done just immediately ahead of
8 the operation, they would be housed in the main camp.

9 Q Stopping there, is there
10 contemplation that in some places the right-of-way
11 clearing will be done immediately ahead of the
12 construction operation in the same construction winter?

13 A Not north of 60 to any
14 extent; south of 60 I believe it would apply.

15 Q My understanding of
16 your proposal is that all clearing of right-of-way
17 would be done a year in advance of construction.

18 A That's right.

19 Q And that would indicate,
20 as I understand it, separate housing for clearing
21 crews.

22 A There would be a special
23 camp for clearing crews, yes.

24 Q Has any thought been
25 given as to the nature of that camp? Is it a movable
26 camp, for example?

27 A It would be more mobile
28 than the main construction camp, which would be located
29 at compressor station sites. But I don't want to
30 leave the impression that it moves every day, it is not

Dau, O'Rourke, Williams
Cross-Exam by Goudge

1 that type of a mobility.

2 Q What route would it
3 follow, the right-of-way?

4 A It would depend on the
5 particular location, if in fact the highway existed
6 adjacent to the right-of-way in that area in all
7 probability you'd move it on the highway.

8 Q If not?

9 A For summer movement it
10 would have to be portable by helicopters or else move,
11 you know, the camp moved by barge or the camp moved
12 by road, and move the crew, hand clearing crew by
13 helicopters.

14 Q As I understand it,
15 though, the clearing operation, the clearing of the
16 right-of-way will take place north of 60 only during
17 winter seasons. Is that so?

18 A Yes, that's correct.
19 It could be moved, it depends on the access in a
20 particular area, and I don't have the complete
21 details of the movement of those camps with me here.
22 I can try and get that information for you.

23 Q Well, is there any
24 contemplation that those camps will move along the
25 right-of-way following the clearing?

26 A I'm sure that could
27 occur in some areas, sir.

28 Q Is that the rule of
29 thumb that you intend to operate by?

30 A I'm sorry, sir, I don't

Dau, O'Rourke, Williams
Cross-Exam by Goudge

1 have that information with me. I would have to get it
2 for you.

3 Q Are you relying on the
4 highway to move these camps?

5 A If the highway existed
6 in the area, we'd certainly use it, yes.

7 Q And if it doesn't exist,
8 will you move them along the right-of-way.

9 A In all probability, yes.

10 Q Now, these camps, I
11 take it, will consist of trailers, to house the 30
12 or 40 men involved.

13 A Yes.

14 Q And has any contemplation
15 been given as to the size of trailer?

16 A I have some information
17 on that and I just can't recall where it is, sir.
18 In 13 A, tab 6 following page 36, is an illustration
19 of a sleigh or wheel-mounted construction camp that's
20 small, 24-man camp. That illustration indicates the
21 sizes of trailers which would be, as shown here would
22 be obviously towed down the right-of-way or on a
23 winter road.

24 Q Now, has any contemplation
25 been given as to the problems, if any, which slopes
26 might present to the movability of that kind of camp?

27 A Yes. I earlier mentioned
28 that the snow road that appeared on the drawing that
29 was a cross-section of the right-of-way may not be
30 located on the right-of-way in areas with steep slopes,

Dau, O'Rourke, Williams
Cross-Exam by Goudge

1 where it would be necessary to depart from the right-
2 of-way to cross a deep ravine. In those cases

3 you would obviously take these apart and move one
4 at a time or something like that.

5 Q Not along the right-of-
6 way. You would move them on a route apart from the right-
7 of-way.

8 A In the illustration that
9 I was referring to, where the pipeline right-of-way
10 crossed a very steep ravine, it would not be possible
11 to move this equipment across the ravine on the right-
12 of-way, and it would be necessary in that case to
13 depart from the right-of-way, from this road to get
14 across this ravine. Not just for the movement of camp
15 but for stringing pipe and other things.

16 Q So what would happen
17 in that instance, if I understand you, is that your
18 snow road would depart from the right-of-way, take a
19 lesser slope across the valley, and that would be
20 used both for the movement of ^{the} clearing camp and later
21 on as your snow road.

22 A Yes, that could be, sir.

23 Q Now, let me suggest to
24 you, Mr. Dau, that there are a variety of methods of
25 clearing that might be used for the right-of-way. One
26 is clearing by hand. A second might be careful machine
27 clearing, and a third would be essentially grading in
28 the conventional manner. Do those three categories
29 of clearing ring true with you?

30 A I don't understand the

Dau, O'Rourke, Williams
Cross-Exam by Goudge

1 last one of grading.

2 Q Stripping, conventional
3 clearing using a machine like a bulldozer.

4 A Yes.

5 Q To clear all in front
6 of it, including the organic mat on the surface.

7 A That's possible, yes.

8 Q Yes. Now there's no
9 doubt even on my limited understanding that those are
10 in increasing order of impact, damaging to the
11 environment. That is conventional clearing is the
12 most damaging, the hand clearing the least damaging.

13 A That's correct.

14 Q And hand clearing presents
15 little or no surface disturbance.

16 A I think that's correct,
17 sir.

18 Q Machine clearing, if
19 carefully done, can accomplish approximately the same.

20 A Yes, it depends on
21 terrain,
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Dau, O'Rourke, Williams
Cross-Exam by Goudge

1 Q Grading as a means
2 of clearing obviously clears the organic layer and
3 therefore in certain layers causes damage, do you
4 agree with that?

5 A Yes.

6 Q Now, you propose in
7 your evidence in chief to use land clearing in the
8 main in the areas where you are also proposing
9 to use Arctic construction methods, is that
10 correct?

11 A Yes.

12 Q As I understand you,
13 however, there may not be an exact coincidence there.
14 There may be some areas where you propose Arctic
15 construction methods where you do not propose hand
16 clearing, is that right? Or is there an absolute
17 coincidence there?

18 A May I have the question
19 again, please?

20 Q Are you going to
21 hand clear everywhere you are going to use Arctic
22 construction methods?

23 A I cannot think of an
24 area right now where we would not.

25 Q So you would use
26 hand clearing everywhere your plan calls for Arctic
27 construction methods?

28 A Yes.

29 Q Now, that means that
30 the distinction between areas to receive hand

Dau, O'Rourke, Williams
Cross-Exam by Goudge

1 clearing and areas to receive machine clearing will
2 be made on the same basis as the distinction between
3 areas to be subject to conventional methods and
4 areas to be subject to Arctic construction methods?

5 A You could, that
6 does not necessarily follow. Hand clearing could take
7 place in areas of conventional winter construction.

8 Q There could be conventional
9 methods, areas of conventional methods where you
10 will also clear by hand?

11 A Yes.

12 Q Where would they be?
13 What kind of circumstance would yield that result?

14 A Well, they would obviously
15 be in the southern part of the system.

16 Q South of 60?

17 A No, in the southern
18 part of the system -- it could occur in unfrozen areas,
19 I cannot think of a specific circumstance.

20 Q Mr. Williams?

21 WITNESS WILLIAMS:

22 A My own preference would
23 be for hand clearing to the greatest possible --
24 economically possible extent.

25 Q Would you go so far as
26 to recommend hand clearing the entire right-of-way
27 from 60 north?

28 A If the manpower were avail-
29 able, yes, I would like to see that and I would dis-
30 agree with Mr. Dau, I would do it in the summertime.

Dau, O'Rourke, Williams
Cross-Exam by Goudge

1 Q I am sorry?

2 A I would -- I think I
3 disagree with what Mr. Dau said earlier. I would
4 do the hand clearing in the summertime.

5 Q What is your recommenda-
6 tion to the owner going to be, Mr. Williams?

7 A To hand clear in the
8 summertime.

9 Q What is yours going
10 to be, Mr. Dau?

11 WITNESS DAU:

12 A I am going to bow to
13 Mr. Williams' knowledge in this matter.

14 MR.GOUDGE: Do you want
15 to break for coffee, Mr. Commissioner, it is
16 3:30.

17 THE COMMISSIONER: Yes, yes.

18 (PROCEEDINGS ADJOURNED)

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1 (PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)

2 MR. MARSHALL: Mr. Commissioner,
3 you asked me to give some indication about Mr. Horte's
4 testimony. I am able to advise you that Mr. Horte
5 will be called alone without others on the panel,
6 that a synopsis of his direct evidence is in the
7 final stages of preparation and we expect to be
8 distributing it to counsel by the end of the week.

9 I should perhaps add that
10 we have had some difficulty in getting the synopsis
11 ready as I am sure my learned friends appreciate.
12 Mr. Horte is going to be dealing with a number of
13 subjects that are arising as we continue with this
14 panel and the one that is to follow so the synopsis even
15 when it is received be complete in that
16 sense. There will undoubtedly be things that come
17 up after we have it prepared.

18 I hope that counsel have
19 not been inconvenienced and I expect that they
20 appreciate that with a policy witness it is really
21 more a matter of him responding to subject areas
22 that they have raised in their cross-examination that
23 require a spokesperson from the company to deal with,
24 and in large part that is what Mr. Horte will be doing.
25 There will of course be some direct evidence led and
26 a synopsis of that will be out by the end of the
27 week.

28 THE COMMISSIONER: Excellent.

29 MR. GOUDGE:

30 A Mr. Williams, I do not

Dau, O'Rourke, Williams
Cross-Exam by Goudge

1 know if you wanted to correct one of the answers that
2 you had given earlier.

3 WITNESS WILLIAMS:

4 A Yes, the last statement
5 that I made just before coffee break. I was reminded
6 at coffee break that there is some very wet terrain
7 just north and south of the Mackenzie crossing on
8 the Fort Simpson amendment and that would be very
9 difficult to hand-clear in the summer time; with that
10 exception, I would --

11 Q Without a bathing suit --

12 A I beg your pardon?

13 Q Without a bathing suit?

14 A Yes, sir.

15 Q I take it then that aside
16 from that, hand-clearing would be your recommendation
17 for the owner north of 60?

18 A Yes, sir.

19 Q Yes.

20 Now, is the criterion then
21 for machine clearing north of 60, the wetness of the
22 terrain?

23 A No, even the area that
24 I am speaking of could be hand cleared in the winter
25 time, but hand clearing in the winter time is
26 difficult in my opinion, particularly when there
27 is deep snow. Where snow roads are required it is
28 important to have the tree cover cropped as closely to
29 the ground as possible and this is best done in the
30 summer time if hand clearing is done. But the

1 question of whether to hand clear or machine clear is
2 a combination of terrain, potential damage to the
3 surface cover and high ice content soils, availability
4 of manpower; all these things would go into the
5 equation, Mr. Goudge.

6 Q You have named three
7 criteria. Are there any others that you would
8 put into the mix in determining whether to
9 clear by hand or machine?

10 A I guess the question
11 of housing the people and moving the camps is
12 another consideration.

13 Q In terms of the time
14 of clearing, obviously if you choose machine clearing
15 it is winter clearing, is that so?

16 A Certainly in areas of
17 high -- generally in frozen areas. Permafrost areas,
18 yes.

19 Q Yes, Is the reverse
20 true that if it is hand clearing it will be summer
21 clearing?

22 A That would be my
23 recommendation, yes.

24 Q Yes, that means then that
25 in all the areas north of 60 where the right-of-way is
26 to be cleared by hand it will be cleared in the
27 summertime?

28 A Except in areas where
29 grading might be allowed, Mr. Goudge, that could
30 be done by a machine in the wintertime. Does that

1 answer that question?

2 Q Well, I am interested
3 in what it does, what this summer clearing recommendation
4 is going to do to your construction schedule. YOU
5 said to begin, that the clearing operation was to
6 take place the winter preceding construction. I
7 take it that if you moved to summer clearing you bring
8 the clearing operation six months closer to the
9 construction operation?

10 A Yes, sir.

11 Q Yes, is that a benefit
12 in your view?

13 A I would think that there
14 is a minor benefit there, in that the later the
15 clearing is done and the less thickness the active
16 layer would have, preceding construction.

17 Q Well, let me come
18 specifically to the clearing of slopes on the right-
19 of-way. You have said, as I understand ^{you} that in all
20 areas of Arctic construction the right-of-way will
21 be cleared by hand; in many areas of conventional
22 construction the right-of-way will be cleared by
23 hand, but in some areas of conventional construction
24 machines will be used, am I right so far?

25 A Yes --

26 Q Now, in --

27 A As far as my recommendation
28 is concerned.

29 Q Yes, that is the recommen-
30 dation of N.E.S.

Dau, O'Rourke, Williams
Cross-Exam by Goudge

1 A I --

2 Q Without getting you
3 into a family fight, I take it that that is so?

4 A Yes, sir.

5 Q Now, in the machine cleared
6 areas that you speak of, will you have a rule of thumb
7 so as to avoid slopes of any given degree? -- And
8 make sure that they are cleared by hand?

9 A I really have not
10 given that that much thought, Mr. Goudge.

11 Q Thinking about it now,
12 can you see any merit in a criterion of slopes above
13 a certain degree being universally cleared by hand?

14 A I am aware that there is
15 such a criterion on the Mackenzie Highway.

16 Q Do you know what the
17 figure is on the Mackenzie Highway?

18 A No, sir, I do not.

19 Q I am advised that it is
20 six degrees. Would you be able to comment on that?
21 Slopes greater than six degrees?

22 A No, I would like to discuss
23 it with them to see what the --

24 Q To see if they tell you
25 the same story they told me?

26 A No, sir, to see how
27 it turned out.

28 Q Yes, as a matter of
29 building principle is there any merit in a rule

Dau, O'Rourke, Williams
Cross-Exam by Goudge

1 requiring clearing by hand when slopes exceed a
2 certain number of degrees?

3 A I would suspect that
4 there would be less environmental damage if some
5 policy in that regard were maintained, yes.

6 Q I take it you agree,
7 you are not sure about the number?

8 A Right.

9 Q You are familiar
10 with the famous slope that failed at San Sault?

11 A Yes, sir.

12 Q That slope would have a
13 greater gradient than the number that ought to be
14 plugged into our formula?

15 A Yes, sir.

16 Q It should have been
17 cleared by hand?

18 A It was a research project,
19 Mr. Goudge. It --

20 Q A proper job would have
21 cleared it by hand had you not been interested in seeing
22 whether you could make it fail or not?

23 A It would have been better
24 done by hand, yes, sir.

25 Q What was the gradient of that
26 slope, do you recall?

27 A I am sure it was mentioned
28 once or twice in the transcript either by myself or
29 Dr. McRoberts. It seems to me that it was in or around
30

1 20%.

2 Q Yes.

3 Now, Mr. Williams, would
4 you also agree that other things being equal,
5 a clearing of for example 120 feet on a slope, yields a
6 greater risk of degradation than a clearing of say
7 20 feet?

8 A Yes.

9 Q Would there be any
10 merit in considering in your right-of-way clearing
11 a rule of thumb that narrowed the width of clearing,
12 on slopes during the clearing phase to something
13 less than 120 feet?

14 A During the clearing phase
15 and then never widen it, Mr. Goudge?

16 Q Widen it immediately
17 prior to construction.

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Dau, O'Rourke, Williams
Cross-Exam by Goudge

1 A I would
2 guess that could be worked in without too much diffi-
3 culty.

4 Q It would cause you very
5 little difficulty, wouldn't it?

6 A I would generally agree,
7 as I mentioned earlier it's a matter of getting snow
8 road constructed at the earliest possible date. You
9 have this problem of close-cropping trees, but if it
10 wasn't over an extensive area it probably wouldn't be
11 a great hardship.

12 Q If it was just on
13 slopes whose gradient was greater than our magic
14 number, it wouldn't cause you any great difficulty?

15 A That wouldn't be very
16 many miles of right-of-way, no.

17 Q What would the minimum
18 width be that you could live with under that regiment
19 on those slopes?

20 A At what period in
21 construction, Mr. Goudge?

22 Q At the clearing phase,
23 so that you could put off the wider clearing until
24 just prior to construction.

25 A If it was hand-clearing
26 in the summertime, you could limit it to the width of
27 the survey cut, I would guess.

28 Q Which would be 10 or
29 20 feet, perhaps?

30 A Or less, yes.

Dau, O'Rourke, Williams
Cross-Exam by Goudge

1 Q Leaving the additional
2 100 feet of clearing until just prior to construction?

3 A That could be done.

4 Q And there could be little
5 loss of efficiency in that scheme.

6 A I think that's correct.

7 Q Has any thought been
8 given, Mr. Williams, to any special treatment concern-
9 ing stump removal as part of your clearing process?

10 A We would like to leave
11 them in, along the ditch line they would be removed
12 with --

13 Q I take it with those ditcher
14 teeth you can leave all the stumps in on your ditch
15 line.

16 A Yes sir. Mind you, when
17 the ditching machine goes through it, it would probably
18 not chop the stump up in small pieces, it would probably
19 lift it out in a fairly large piece, depending on
20 how solidly it was frozen into the soil.

21 Q What is your contemplation
22 concerning stumps across the rest of the right-of-way?
23 Will they be taken out as part of the clearing process
24 or not?

25 A Certainly not where
26 hand clearing was done, or machine clearing for northern
27 construction practices. If it was an area where grad-
28 ing could be allowed, the stumps would be removed
29 prior to grading.

30 Q Yes. I take it in those

Dau, O'Rourke, Williams
Cross-Exam by Goudge

1 areas where hand clearing occurs, the stumps will be
2 taken out immediately prior to construction?

3 A Again we're talking
4 about where we want to grade. If we're just going to
5 put a snow road over it and use it for working space,
6 the stumps would stay in place.

7 Q Now you referred, Mr.
8 Williams, in your evidence -- or perhaps Mr. Dau did --
9 to the use of burning sleds. Burning sleds, I take
10 it, will be used in certain circumstances to dispose
11 of the slash cleared during the clearing process. Is
12 that correct?

13 A That would depend on
14 the time of year the clearing was done. They could
15 only be used in the wintertime. If you did hand clearing
16 to the timber and brush would have to be stacked the
17 side of the right-of-way for disposal in the winter-
18 time. Sorry, if hand clearing were done in the summer-
19 time, that procedure would be followed.

20 Q Yes, Well, let's just
21 follow that through. Hand clearing in the summertime
22 results in slash stacked at the edge of the right-of-
23 way?

24 A Yes sir.

25 Q Yes, and how is that slash
26 disposed of?

27 A In the following winter
28 it would probably be burned, but not along the right-
29 of-way in a windrow, as is standard practice in southern
30 areas. It would --

Dau, O'Rourke, Williams
Cross-Exam by Goudge

1 Q What's a wind row?

2 A Wind row?

3 Q Is that like a roam type
4 blade?

5 A No sir, it's a mound of
6 anything, in a continuous row. In this case we're
7 talking about brush and slash and so forth.

8 Q I see. Under the regiment
9 of summer clearing, will burning sleds ever be used?

10 A Yes, they could be used
11 the following winter.

12 Q I take it they would be
13 used no matter when the clearing was done, where the
14 burning had to take place over sensitive soil?

15 A Well, there are a couple
16 of alternatives there. The material can be hauled to
17 an area that is not sensitive, like a rock or a gravel
18 area, and burned there. Or it could be burned in
19 sleds, or it could be chipped too. We've kicked that
20 idea around.

21 Q I think we agree that
22 the one thing you couldn't do is to burn it in
23 sensitive areas?

24 A Burn it in place on the
25 ground in sensitive areas, no, that would not be a
26 good procedure.

27 Q Have you given any
28 thought to defining sensitive areas in that context?

29 A Well, they would be
30 similar to the areas where Arctic construction is

Dau, O'Rourke, Williams
Cross-Exam by Boudge

1 mandatory.

2 Q I take it then you would
3 feel free to burn slash in place on the ground in
4 areas where conventional construction methods were
5 used, but not where Arctic construction methods were
6 used?

7 A Yes.

8 Q It's the same cut-off
9 point.

10 A Well, in -- yes, that's
11 true. I was going to say within the Arctic construc-
12 tion technique general area, there would be areas
13 that would not have sensitive permafrost, such as
14 rock or gravel areas.
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Dau, O'Rourke, Williams
Cross-Exam by Goudge

1 Q Well, without getting
2 into an issue that my friend, Mr. Scott, has stolen,
3 those areas would be areas of conventional construction
4 technique.

5 A They could be.

6 Q Now, you referred to an
7 additional method of disposing besides burning, that
8 is the use of chippers. You've explored that to some
9 degree.

10 A Yes sir.

11 Q Are you engaged in
12 studies to determine the efficacy of the use of
13 chippers?

14 A No, not right now.
15 We have done a bit in the past.

16 Q How do you rate that
17 method by comparison with burning?

18 A In areas with very
19 light tree cover, which is a good percentage of the
20 route, if there was a problem in disposing of the
21 brush by burning, it is a reasonable alternative, yes,
22 and the disposal of the chips could be done in a
23 couple of manners. It could be hauled away or it
24 could be probably blown over the right-of-way. The
25 quantity is so small that it would be hard to see it
26 after you're finished.

27 Q Have you developed any
28 method for choosing where you will use chippers and
29 where you will use burning?

30 A No sir.

Dau, O'Rourke, Williams
Cross-Exam by Goudge

1 Q Do you expect to, or will
2 that be a decision made by the contractor?

3 A I would think in due
4 course we would -- Northern would make some recommen-
5 dations in this regard.

6 Q You have no opinion on
7 their relative merits now?

8 A Just that they are
9 options available.

10 Q Dealing only then with
11 burning as an alternative, in your view are any rules
12 of thumb necessary as to placing the burning pile
13 close to the edge of the right-of-way?

14 A In areas where conven-
15 tional construction is permissible?

16 Q Or Arctic construction.

17 A Well, in Arctic construc-
18 tion areas, I don't think the slash would be burned
19 on the ground. I think we went around that, didn't
20 we, once?

21 Q Yes, but the sled could
22 be anywhere on the right-of-way, in your view.

23 A I would think it would
24 be safer if it were closer to the centre of the right-
25 of-way.

26 Q The same would be true
27 of any slash pile on the ground in conventional areas.

28 A Yes sir.

29 Q You have no rule of thumb
30 as to a certain distance of removal from the edge of

Dau, Williams, O'Rourke
Cross-Exam by Goudge

1 the right-of-way.

2 A The usual practice, I
3 think, is to have it fairly well centred on the right-
4 of-way.

5 Q Centered on the right-of-
6 way?

7 A Yes sir.

8 Q I see. Mr. Williams, let
9 me move if I can as a last subject to deal with you
10 today on the snow roads. You've acknowledged, I think,
11 that snow roads are vital as a prerequisite for your
12 construction procedures.

13 A Yes sir.

14 Q They're the first step,
15 basically, in your winter's construction program.

16 A Yes sir.

17 Q The first thing that
18 has to be done to get the game under way each building
19 winter.

20 A Yes sir.

21 Q And looking at your
22 building schedules, your construction schedules,
23 you've developed for each spread target calendar days
24 for the starting of construction of snow roads, is
25 that so?

26 A Yes sir.

27 Q I take it you're not
28 wedded to those calendar days, but those are your best
29 guess as to when building of snow roads could commence.

30 A I think that's generally

Dau, O'Rourke, Williams
Cross-Exam by Goudge

1 correct, yes.

2 Q In other words, you
3 aren't going to wait until the specified day on the
4 calendar and commence your building then of snow roads,
5 whatever the other conditions may dictate.

6 A No. In my view we'd
7 get at it just as quickly as possible.

8 Q It might be earlier than
9 the date on the schedule; it might be later.

10 A Yes sir.

11 Q Now, I take it the key
12 thing from your point of view is to establish as quickly
13 as possible a viable snow road.

14 A To establish as quickly
15 as possible adequate snow cover over the right-of-
16 way so that construction can begin. I think I mentioned
17 this morning that this doesn't necessarily mean that
18 you have to have a high quality snow road in the first
19 instance. When you're working close to camp you can
20 get by with something less than the best.

21 Q Yes. How are you going
22 to measure an acceptable less than best snow road?

23 A Sufficient quantity of
24 snow, protective snow cover to allow construction to
25 proceed without causing excessive damage to the surface
26 vegetation, and along with that, something that's not
27 too rough, to preclude travel.

28 Q So it's depth of snow
29 that's the basic criteria. Is that correct?

30 A Along with terrain, Mr.

Dau, O'Rourke, Williams
Cross-Exam by Goudge

1 Goudge. Some areas are much hummocky -- more hummocky
2 than others. The hummocky terrain generally takes more
3 snow than the smoother surfaces.

4 Q Yes. Can you give me a
5 range of minimum snow depths that would be necessary
6 north of 60 to get that basic snow road under way?

7 A Oh, four to six inches
8 of compacted snow, in my opinion, would be adequate
9 to start.

10 Q So a minimum requirement
11 is four to six inches before you can do anything more.

12 A Minimum, yes sir.

13 Q And I think on the
14 ratios that you gave us last time round, four to six
15 inches of compacted snow approximates to about double
16 that snowfall.

17 A Yes sir. No, no, I
18 don't think I said that.

19 Q What does it approximate
20 to then, in terms of snowfall?

21 A I think we talked about
22 compacted snow having a density of .5 grams per cc.
23 as compared with water with one gram per cc.

24 Q I thought --

25 A Yes, you're right, yes,

26 Q -- you said .25
27 grams per cc. for snowflakes.

28 A The snow on Dolomite Lake.

29 Q Yes.

30 A Yes, you're absolutely

Dau, O'Rourke, Williams
Cross-Exam by Goudge

1 right.

2 Q So if you had to set a
3 rule of thumb for yourself, you'd wait for eight to
4 12 inches of snowfall if you were relying only on
5 natural snow.

6 A If you were only relying
7 on natural snow, yes.

8 Q Now, do any other criteria
9 concern you in measuring the basic prerequisite for
10 snow roads, such as the freezing level in the earth?

11 A The freezing level in the
12 earth?

13 Q Yes, the degree to which
14 the ground has become frozen, the active layer has
15 become frozen. Is that a concern in determining when
16 your snow road becomes passable for the first time?

17 A Yes, certainly that's
18 a factor.

19 Q So we now have two
20 factors. We have a minimum snow cover and a concern
21 over the degree to which the active layer is frozen.

22 A Yes sir.

23 Q Could you quantify for
24 me what the minimum degree of freezing in the active
25 layer would have to be?

26 A I would think in the
27 range of 8 to 10 inches from the surface.

28 Q From the surface down?

29 A From the surface down, yes.

30 Q I see, so you'd have to

Dau, O'Rourke, Williams
Cross-Exam by Goudge

1 have eight to ten inches of frozen soil from the top
2 down, and eight to 12 inches of snowfall before a
3 snow road is usable, in your opinion.

4 A If you were just relying
5 on snowfall.

6 Q Yes. Would you look
7 to any other criteria to determine whether the snow
8 road was usable besides those two?

9 A Oh, there will be areas
10 that the north of 60 that are in the discontinuous
11 zone, of course, that are normally thawed. There will
12 be some boggy areas that will not support heavy
13 construction equipment until they have a fairly sub-
14 stantial depth of frost. That would be another
15 consideration.

16 Q The same criterion but
17 a different number attached to it.

18 A Yes, that would depend
19 on the type of bog. Generally you would need more
20 frost depth than that.

21 Q Yes. Now, you've
22 agreed with me, I think, Mr. Williams, that snowfall
23 is not something that the calendar will produce
24 automatically, and the degree to which you must await
25 beyond the target calendar date for snowfall puts
26 pressure on your schedule.

27 A Unless you have an
28 alternative means.

29 Q And your alternative
30 means are three, as I understood them: Snow

Dau, O'Rourke, Williams
Cross-Exam by Goudge

1 harvesting, snow-making, and snow fences.

2 A Yes sir.

3 Q And the degree to which
4 those three can make up the basic prerequisite snow
5 alleviates the pressure on the schedule.

6 A Yes sir.

7 Q Now, I take it that
8 with any of these three ways of helping you get
9 additional snow, compaction has to be used just as
10 it's used for natural snowfall, to produce your snow
11 road.

12 A Certainly in varying
13 degrees, Mr. Goudge. With snow manufacturing you can
14 manufacture -- you can control the density. Snow
15 harvesting, you can harvest it and load it onto vehicles
16 in a manner that the density is increased. Snow
17 accumulated at snow fences, because of the way it's
18 placed there, it is usually more -- generally more
19 dense than softly fallen snow in the bush country.
20 I'm sorry, what was the question?
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1
2 Q I would rephrase the
3 question to fit your answer if I could remember
4 what I asked.

5 A Let me move on to --
6 MR. MARSHALL: Check with
7 your thumb.

8 MR. GOUDGE: Let me move on
9 to ask you about the way in which you propose to
10 compact the snow. I take it that you basically
11 have two choices: compaction, using vehicles that
12 are tracked and compaction using vehicles that are
13 rologon in type, is that it?

14 A Yes, generally, unless
15 something, someone develops something between then
16 and now and we will be working on it.

17 Q Do you see any advantages
18 for either over the other?

19 A I really have not had
20 that much experience with rologons, Mr. Goudge.

21 Q They could be used for
22 compaction, I take it?

23 A Yes, I think they can.

24 Q YOU have not tested
25 them for that purpose?

26 A No, sir.

27 Q I take it on hummocky land
28 at least, the track vehicles used for compaction might
29 present some difficulty?

30 A It tends to span the

Dau, O'Rourke, Williams
Cross-Exam by Goudge

1 depressions between the hummocks, yes.

2 Q In hummocky land then
3 I take it rologon vehicles for compaction might
4 be preferable?

5 A I would think that that
6 is a good possibility.

7 Q Would you say that as
8 a rule of thumb everywhere rologons could be
9 used for compaction the surface vegetation would be
10 that much more preserved?

11 A Yes, the only -- I am
12 sure that generally speaking that is right. I am
13 not sure what the ground pressure bearing of a rologon
14 is or whether you can vary it to any great extent.
15 In addition to compacting the snow you would like to
16 impart some compaction to the moss and lichen cover to
17 advance the penetration of the frost, so I am not
18 just certain how that -- probably you could load
19 them up to get the compaction that you would like
20 to have.

21 Q Let me deal with two
22 quick points and then see if we cannot perhaps move
23 on to another day. One of the problems that you
24 are going to have with snow roads concerns the end
25 of the season. That is the other side of the coin
26 to the beginning of the season, is that not so?

27 A In that they are going
28 to deteriorate as the weather warms?

29 Q Yes.

30 A Yes.

Dau, O'Rourke, Williams
Cross-Exam by Goudge

Q Now, have you developed any criteria for stopping using snow roads at the end of the season?

A No, we have given it some thought. We have -- we did the test at both Norman Wells and Inuvik and one thing that I did not mention this morning in that regard is that if you are faced with the problem of moving out of camp, for instance and the snow road is too soft in the daytime to run over it, there is a good possibility that you could do it in the nighttime hours when it is cooler, so -- and this could probably to some extent apply to the construction also if it is too soft in the daytime and you are anxious to complete a particular section you might consider going to a nighttime operation when it is colder.

Q That will only help you so long, I take it?

A Yes, sir.

Q How do you determine when it will not help you any more and you have to get off that snow road?

A When you start to cause damage to the surface vegetation and maybe when the land use inspector says shut her down.

Q Do you have any opinion as to --

THE COMMISSIONER: That is one way of telling, --

1 MR. GOUDGE:

2 Q Do you have any
3 opinion as to when that ought to happen and what
4 criteria ought to be used to come to that conclusion?

5 A I think it should be
6 a day to day decision by observing what is taking
7 place.

8 Q What do you observe?
9 Do you observe the melting?

10 A The effect of the
11 equipment on the ground surface.

12 Q What about the depth
13 of thaw?

14 A I would not -- we are
15 talking in areas now where we are in Arctic construction
16 areas.

17 Q Yes.

18 A I would not expect any
19 thaw in the ground.

20 Q You would expect to
21 have to get off the snow road before there was
22 any thaw in the ground?

23 A Yes, sir.

24 Q Could you use the
25 depth of thaw in the actual snow road itself as
26 a criterion for measuring when you should get off?

27 A Well, again, that
28 would depend on the depth of snow that you had and
29 what type of equipment you were using at the time and
30 what phase in the operation you are in, -- if you are

1 moving out, moving camps out for instance then you
2 can move them out on sleds, I could see this period
3 being extended somewhat from the actual pipeline
4 construction aspect.

5 Q Your basic criterion
6 then comes back to whether by using the snow road
7 you are damaging the surface vegetation?

8 A That would be my
9 criterion.

10 Q How does that criterion --
11 how is it made operative when the surface vegetation
12 is under the snow road, can you help me with that?

13 A If --

14 Q You do not know what
15 is happening to the surface vegetation?

16 A Personally I would
17 assume that ^{if} the tractor cleats were not getting
18 down to the vegetation, that the snow was preventing
19 that from happening, that you would still be safe.

20 Q I see, so that you could
21 use as your criterion whether the vehicle cleats
22 exposed the surface vegetation?

23 A Yes, sir.

24 Q If it did you were
25 on too long, if it did not you were still all right?

26 A Yes.
27 Or you might change your schedule.

28 Q So that you did not
29 expose the surface vegetation?

30 A Yes, such as working

1 at night.

2 Q And is that basically
3 the criterion you are proposing to the owner to
4 determine the length of use of the snow road during
5 the construction season?

6 A That would be my
7 recommendation, sir.

8 Q Yes. I do not know
9 how long you intend to go on, Mr. Commissioner.
10 This would be a satisfactory point for me to stop.
11 I am prepared to go on, though, if you wish?

12 THE COMMISSIONER: No, we
13 will adjourn until 9 o'clock in the morning and we
14 will sit tomorrow morning and tomorrow afternoon and
15 on Friday we will perhaps start earlier than
16 9 o'clock so that we can get as much evidence in
17 for the weekend as possible and I understand, Mr.
18 Marshall, that the operating and maintenance panel
19 is standing by to follow Mr. Dau and Mr. Williams
20 and Mr. O'Rourke whenever we have completed their
21 testimony.

22 MR. MARSHALL: Yes, sir,
23 they are.

24 THE COMMISSIONER: Okay,
25 9 o'clock tomorrow then.

26 (PROCEEDINGS ADJOURNED TO MAY 15, 1975)
27
28
29
30

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MACKENZIE VALLEY PIPELINE INQUIRY

IN THE MATTER OF AN APPLICATION BY CANADIAN ARCTIC GAS
PIPELINE LIMITED FOR A RIGHT-OF-WAY THAT MIGHT BE
GRANTED ACROSS CROWN LANDS WITHIN THE YUKON TERRITORY
AND THE NORTHWEST TERRITORIES FOR THE PURPOSE OF THE
PROPOSED MACKENZIE VALLEY PIPELINE

and

IN THE MATTER OF THE SOCIAL, ENVIRONMENTAL AND ECON-
OMIC IMPACT REGIONALLY OF THE CONSTRUCTION, OPERATION
AND SUBSEQUENT ABANDONMENT OF THE ABOVE PROPOSED
PIPELINE

(Before the Honourable Mr. Justice Berger, Commissioner)

Yellowknife, N.W.T.

May 15, 1975.

PROCEEDINGS AT INQUIRY

VOLUME XXXIX

CANADIAN ARCTIC
GAS STUDY LTD.

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JANUARY 10, 1906

AND
OF THE
COMMISSIONER OF THE GENERAL LAND OFFICE

IN RESPONSE TO A RESOLUTION PASSED BY THE SENATE

JANUARY 10, 1906

THE UNITED STATES OF AMERICA

DEPARTMENT OF THE INTERIOR

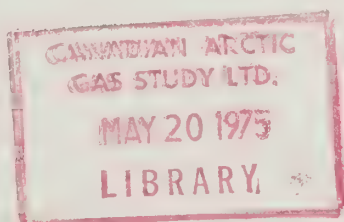
WASHINGTON, D. C.

1906

APPEARANCES:

Mr. Ian G. Scott, Q.C. Mr. Stephen T. Goudge, Mr. Alick Ryder and Mr. Ian Roland	for Mackenzie Valley Pipeline Inquiry
Mr. Pierre Genest, Q.C. Mr. Jack Marshall, Mr. Darryl Carter, and Mr. John Steeves	for Canadian Arctic Gas Pipeline Limited
Mr. Reginald Gibbs, Q.C. Mr. Alan Hollingworth	for Foothills Pipe Lines Ltd
Mr. Russell Anthony, Prof Alastair Lucas	for Canadian Arctic Resources Committee
Mr. Glen W. Bell and Mr. Gerry Sutton	for Northwest Territories Indian Brotherhood and Metis Association of the Northwest Territories
Mr. John U. Bayly	for Inuit Tapirisat of Canada and the Committee for Original Peoples' Entitlement
Mr. Ron Veale and Mr. Allen Lueck	for Council for Yukon Indians
Mr. Carson H. Templeton	for Environment Protection Board
Mr. David Reesor	for Northwest Territories Association of Municipalities
Mr. Murray Sigler	for Northwest Territories Chamber of Commerce

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Dau, O'Rourke, Williams

Yellowknife, N.W.T.

May 15, 1975.

(PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)

MR. MARSHALL: Mr. Commissioner,
there were a couple of small matters that the panel
undertook to attempt to obtain some information on,
and I understand that they've done that overnight,
and are prepared to speak to those matters now. Mr.
Williams?

PHILIP HARVEY DAU,
JOHN RICHARD O'ROURKE,
GUY LESLIE WILLIAMS, resumed:
Mr. Goudge,
WITNESS WILLIAMS: with res-

pect to your question about the size of survey crews,
I'd like to draw your attention to our preliminary
report, project survey concept, dated June 7, 1974.
It's in our library upstairs, and it's listed as Volume
No. 436. In Appendix "A" of that volume, a study
has been done on eight systems of surveys conducted at--
some in summer, some in winter, using various means
of transportation and so forth. The system that we
like and referred to mainly yesterday is No. 2, which
is summer survey hand-cutting, helicopter support
daily from camp located on river barge, and moved by
tug every two weeks. That is in a spread sheet in the
appendix, and following that there are more details
with respect to the crew, and it is suggested that
this particular crew has a staff of 14, including
the cook and bull cook, but not including a helicopter
pilot and a mechanic. Taking those into account

Dau, O'Rourke, Williams
Cross-Exam by Goudge

1 there would be 16 and that is stricly for survey.
2 It may be augmented slightly with a small drilling
3 crew if found necessary.

4
5 CROSS-EXAMINATION BY MR. GOUDGE (CONTINUED):

6 Q I take it that would be
7 the scheme you'd recommend to the applicant, from
8 among those eight?

9
10 A That is the scheme that
11 Northern Engineering would now recommend, yes.

12 Q Did you have something
13 else, Mr. Williams?

14 A Yes sir. The second
15 item was with respect to roam and V-type cutting
16 blades for clearing. I've been advised that the
17 roam type is the preferable one for this particular
18 project. It is a specially designed brush blade that
19 is mounted on a standard tractor. It differs from
20 the standard blade in that the leading edge of the
21 blade is longer. It projects a few feet wider than
22 the dozer itself. It is fixed mounted at an angle of
23 about 60 degrees to the direction of movement of the
24 tractor, and it is equipped with a saw tooth blade on
25 the bottom of the dozer blade. So that the cutting
26 action is a saw slicing action rather than a pushing
27 movement. It is ideal in bush country where the
28 maximum size of timber is about 12 inches at the
29 butt. It's not too successful if there is much rock
30 in the terrain because the blade gets damaged easily.

The V-type is similar to a

Dau, O'Rourke, Williams
Cross-Exam by Goudge

1 snowplough with the blades in a V-shape about 45
2 degrees to the direction of movement. It is less
3 preferable in that it does not have the saw tooth
4 action and it pushes trees in both directions, whereas
5 the roam blade tends to push them all in one direction,
6 making it easier to windrow.

7 Q I take it then that
8 your recommendation would be that clearing be done
9 insofar as it's done by machine with the roam type
10 blade.

11 A That is the advice of
12 our experts in this area, yes sir.

13 Q Thank you for that,
14 Mr. Williams. Does that complete what you wanted to
15 carry over from yesterday?

16 A Yes, thank you, sir.

17 Q I was dealing then with
18 you yesterday at the end of the day with this matter
19 of how one tells when the snow road is no longer
20 usable at the end of a season, and I think you
21 agree with me that there has to be some criterion
22 that the contractor will use to determine that. Is
23 that so?

24 A Yes sir.

25 Q I take it once the
26 determination is made, a good deal of work remains to
27 be done by way of removing machinery from the snow
28 road.

29 A Yes sir. I wouldn't see
30 this coming on real suddenly, Mr. Goudge. I think

Du, O'Rourke, Williams
Cross-Exam by Goudge

1 there would be warning that possible difficulties
2 are arising. The whole -- in addition, the whole
3 road would not all go out at once. Certainly the
4 south facing slopes would be affected first, and some
5 remedial measures could be taken in these spots to
6 try to increase the life of the road.

7 Q But I take it that
8 at some date in the spring of each year for each
9 construction spread someone must decide, "We must now
10 begin to remove our equipment."
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1 A Yes, sir, someone or
2 some group of people, yes.

3 Q And that removing of
4 equipment would itself take several days at
5 least?

6 A I guess that would depend
7 on how far it would have to be moved, Mr. Goudge,
8 several days I think is reasonable, yes.

9 Q So that whatever criterion
10 is used it has to be a criterion that allows another
11 several days before damage will occur?

12 A That would be wise,
13 yes.

14 Q The criterion you
15 suggested yesterday was the showing of the surface
16 through the snow?

17 A No, sir.

18 Q Perhaps I misunderstood.

19 A When it appeared that
20 damage was likely to occur to the vegetative
21 surface.

22 Q And how do you judge that?

23 A By observation, what
24 you observe. The action of the vehicles being used
25 on the right-of-way.

26 Q Could you elaborate,
27 what are you looking for?

28 A To see if the parti-
29 cularly the dozers heavy track equipment, if the
30 are penetrating through the snow to the

1 vegetative cover, I would think would be the major
2 observation.

3 Q Have you considered any other
4 mechanisms to give you this information such as, and
5 I asked you this yesterday, but perhaps you can
6 consider it again, measuring the depth of thaw in
7 the snow road, so that when the thaw depth in the
8 snow road reaches a certain level a determination
9 is made that the road is no longer usable?

10 A Yes, during the daytime
11 I suppose this can be done, you are -- at that time of
12 year you are going to get some freezing at night.
13 Mr. Goudge, it is not going to stay constant over
14 the 24 hour period.

15 Q In your opinion could a crit-
16 erion be worked out using depth of thaw into the
17 snow road surface to determine when the snow road
18 must be vacated?

19 A I would not think of
20 it as a sole criterion, it may be part of the total
21 picture.

22 Q Any other factors that
23 you think ought to go into determining that decision
24 as to when to vacate a snow road?

25 A Other factors that would
26 be considered; if we are talking about the snow road
27 now, Mr. Goudge, as opposed to the working area of
28 the right-of-way.

29 Q If you wish A Let's
30 just talk about the snow road where the snow cover --
so the snow thickness will be deeper than the balance of

Dau, O'Rourke, Williams
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1 it and you may be scrambling to get a camp out, move
2 it out, is this the situation that you have in
3 mind?

4 Q I would like the answer to
5 that situation.

6 A Of course, if -- the
7 best situation if the snow road is still not in
8 good shape, there is no problem, but it is starting
9 to thaw, --

10 Q How do you decide when
11 to begin to move that camp out, in order to get it
12 out without damage?

13 A It would be a function of
14 how the extent of the deterioration of the road,
15 which is partly a function of the topography, the
16 type of equipment that you have to do the job, if
17 you have sufficient sled equipment, for instance, to
18 move them out, with soft track vehicles you can work
19 on a soft surface snow road longer than certainly
20 with wheeled vehicles. If the temperatures at night
21 get down to give you some relief to work at that
22 time but when the -- when it appears that damage
23 is likely to occur to the vegetative surface in
24 areas where conventional -- I am sorry, where Arctic
25 construction techniques are used, then it would be
26 important to move out at the -- when it appears that
27 a deterioration or a possible damage to the terrain
28 is going to occur.

29 Q And I take it that if
30 the tracks of the track vehicle were already cutting

1 through the snow road that it would be too late
2 to get the camp out without damage?

3 A The tracks of the track
4 vehicles?

5 Q If they were exposing the
6 surface layer and if the decision to vacate was left until
7 that happened, removal of the camp thereafter along
8 the snow road would cause the damage in all
9 probability, would you agree with that?

10 A Yes, sir.

11 Q So that criterion, the
12 exposure of the surface layer by the tracks of the track
13 vehicle perhaps is not operable resulting in damage.
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1 A I don't think I agreed
2 that that was a criteria, exposing the surface. That
3 is the snow is all gone?

4 Q The track is cutting
5 through the snow cover. If you wait till the track
6 cuts through the snow cover to the surface, you wait
7 too long. Do you agree with that?

8 A It would depend on the
9 extend of it, Mr. Goudge, if it's in just a small area
10 where some remedial action could be taken,
11 it's conceivable that it wouldn't be too late.

12 Q You run a high risk by
13 waiting that long. Would you agree with that?

14 A There is some risk, yes.

15 Q It would be desirable
16 to create a criteria that allowed you to get out
17 sometime before that occurred. Would you agree with
18 that?

19 A It would be desirable
20 but I'm not sure that it's achievable, Mr. Goudge,
21 because we have had many experiences where the weather
22 starts to turn warm, say in late March or very early
23 April, and then you get some extremely cold weather
24 after that and if you've moved out you've gone too
25 soon. So I think that would be a factor.

26 Q It's a trade-off between
27 adding further miles to the line and running a risk
28 of damaging the surface layer.

29 A You may shut down for
30 a few days to observe what's happening, depending on

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1 the time of the year. If it appears that you have some
2 warm weather at an unseasonably early time, I don't
3 think that you would panic and move out.

4 Q Snow roads are common
5 in the north, no doubt about that.

6 A Yes sir.

7 Q Do you know what rules
8 of thumb are generally used now to remove vehicles
9 from snow roads at the end of the season?

10 A Oh, generally with
11 respect to the snow road that has been in operation
12 off and on along -- generally along the C.N.T. tele-
13 phone line, I think that is usually set by a date,
14 usually there is a week or ten days' notice given that
15 everything has to be clear by a fixed date, about ten
16 days ahead of time.

17 Q And I take it a week to
18 ten days is a fair time span between the decision that
19 the road is going to be unserviceable shortly, and
20 the removal of the last piece of equipment from the
21 road. You need a week to ten days.

22 A It would be adequate,
23 yes, for, we're speaking of pipeline construction now.

24 Q It would be adequate for
25 pipeline construction?

26 A Yes sir.

27 Q Less than that I suppose
28 would be cutting it fine.

29 A I think that's reasonable,
30 yes sir.

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1 Q In present circumstances
2 where snow roads are used today in the north, do you
3 have any knowledge of the kinds of criteria used at
4 the front end of the seven to ten-day notice period
5 to determine that vehicles must vacate snow roads?

6 A No sir.

7 Q Mr. Williams, let me
8 just very briefly finish this matter of snow roads by
9 asking you to refer to a specific example, if I might,
10 in Section 13 A of the application, if you could dig
11 that out, please, because I think it might help me
12 at least. I'd like you to turn to the pipeline route
13 map No. 1 A-0211-1001, that's the pipeline route
14 map for Milepost 0 to Milepost 140. Have you got
15 that in front of you, sir?

16 A Yes sir.

17 Q I take it I understand
18 correctly that the campsite that begins that construc-
19 tion segment is at Swimming Point.

20 A We are speaking of
21 spread "A" in the first winter of construction?

22 Q Yes sir.

23 A The camp is at river
24 Milepost 1042 from the summer of -- depending on what
25 schedule you're on -- from the summer of '76 to --

26 Q Let's use the dates on
27 the map, Mr. Williams.

28 A -- to February '77,
29 when the camp is moved to M-01 and is there from
30

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1 February until April, yes sir.

2 Q Now, if we can use this
3 as an example, I take it that that camp is on the
4 east side of the east channel, or is it -- I haven't
5 got my directions -- on the left-hand side of the
6 east channel as you look at it. That's where it's
7 indicated on the map.

8 A Yes sir.

9 Q I take it then that the
10 crews from the camp would have as their first task
11 in the first construction winter the building of the
12 line from Milepost O back to the camp.

13 A That would be the first
14 piece of work, yes.

15 Q First order of business.

16 A Yes sir.

17 Q Yes.

18 A Not necessarily in that
19 direction, Mr. Goudge. The arrows that we've shown
20 on the direction are just the general direction of
21 movement, but in this case it could well be that you
22 start at the camp and work north and then turn the
23 spread around and cross the river when an ice bridge
24 has been built, and then continue south from there.

25 Q Have you decided which
26 way that 24-odd mile section of the line will be
27 built from the camp to Milepost O, or in the other
28 direction?

29 A No, it hasn't been
30 decided. It would depend on weather conditions,

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1 particularly snowfall in the early part of the year.
2 If the snowfall is very light and you wanted to get
3 started, it's similar to the situation we discussed
4 yesterday, that you would work out from the camp;
5 whereas high-grade road would not be required,
6 however, if there was considerable snowfall and the
7 snow fences had accumulated a lot of snow and it didn't
8 take long to build, then it would be preferable to
9 start at Taglu and work south.

1 Q To do it the latter way
2 you have to build a 24 mile snow road before the
3 ditcher cuts into the ground for the first time?

4 A Yes, sir.

5 Q Yes, and I take it that
6 might cause you some problems because of lack of
7 snow?

8 A Yes, sir.

9 Q If it did your solution
10 would be to build the line in the other direction
11 from the camp to Milepost O?

12 A Yes, sir.

13 Q Is it possible to
14 build in that direction -- I take it the answer is
15 yes?

16 A Yes, sir.

17 Q I am mesmerized by your
18 schematics which have the track vehicles on the
19 right-hand side of the ditch, as I recall them. When
20 you build the line in the other direction, do you
21 have to put the track vehicles on the other side
22 of the ditch or do you run them backward?

23 A You can do either, Mr.
24 Goudge, you can change the ditch line to the
25 other side of the right-of-way, or you can, for short
26 times anyway, you can run the equipment backwards. It
27 is not desirable, but it is possible.

28 Q Could you do it over
29 24 miles?

30 A It would not be efficient.

1 Q Wouldn't you want to run that
2 spread from Milepost 0 / ^{back} to the camp if at all possible?

3 A Yes, sir.

4 Q The pressure on you
5 would be to do just that, not the reverse?

6 A My first consideration,
7 Mr. Goudge would be to get started as quickly as
8 possible to be doing something to get pipe buried in
9 the ground, anything that you can do in the early
10 part of the season is money in the bank.

11 Q I take it though that in
12 terms of the economics of laying pipe it is neither
13 desirable to run the machines backwards nor to transfer
14 the working lane to the other side of the ditch.

15 A Neither is desirable,
16 no, but not out of the question.

17 Q If at all possible you
18 would work that machines from Milepost 0 back to the
19 camp?

20 A That would certainly
21 be preferable.

22 Q And I take it you would
23 only do the other if you were unable to build the
24 24 mile snow road by the time your schedule called
25 for the ditching to begin?

26 A Yes, sir.

27 Q However, if the snow
28 road could not be built in time, you would build
29 the line backwards, if I could use that expression?

30 A Yes, sir -- that would

1 be my recommendation.

2 Q Yes.

3 Now, let's assume that your
4 attempt is to build the line forwards from Milepost 0
5 Swimming Point, do you have any detailed plans as to
6 where the snow for the necessary 24 mile snow road would
7 come from?

8 A Again, this particular
9 area is out of the bush country and I think
10 snow fences would be an ideal way of accumulating
11 snow.

12 Q What about snow harvesting?
13 Would you intend to use it, for example in that
14 segment?

15 A Yes, certainly it is
16 an alternative.

17 Q Yes, would you have identified
18 any sources for snow harvesting?

19 A No, sir.

20 Q When would you anticipate
21 those sources to be identified?

22 A Oh, during or before
23 the location survey work, Mr. Goudge with the assistance,
24 and advice from fish biologists.

25 Q Would that be the same for
26 sources for water for snow making?

27 A Not really necessarily.
28 Possibly.

29 Q Those sources as well have
30 to be identified early?

1 A Yes, sir.

2 Q You have to place equip-
3 ment there the previous winter?

4 A Not in this particular
5 case because you have -- you are right at
6 the Mackenzie River as far as source of water to
7 start, are you speaking of manufacturing snow, now?

8 Q Yes, I understand.

9 Let me move to the
10 crossing of the east channel. That has to be done
11 during the first construction winter on this
12 diagram, is that so?

13 A The installation of the
14 pipe across the river or the moving --

15 Q No, sorry, let me
16 be clear, the movement of the camp across the east
17 channel occurs during that first construction winter
18 as I read your map.

19 A Yes, sir.

20 Q In fact, the camp
21 moves to M-01 by February of the first winter, the
22 first construction winter?

23 A Yes, during February.

24 Q You say during February.

25 A Yes, sir.

26 Q You would anticipate it
27 not to commence moving until February?

28 A Oh, it is possible that
29 part of it might move earlier, not much earlier and an
30 ice bridge would have to be constructed there.

1 Q Your plans call for
2 an ice bridge across the east channel?

3 A Yes, sir.

4 Q I take it that is to take
5 the weight of the camp equipment and the ditching
6 equipment which would have to move during that
7 season across that channel?

8 A All the heavy equipment
9 and a considerable amount of pipe would have to
10 be moved across.

11 Q And my information is
12 that in January, for instance of this year, that
13 channel had an ice thickness of only 18 inches, which
14 obviously would require supplementation by an ice
15 bridge --

16 A Yes, sir --

17 Q -- to move the type
18 of machinery you are talking about?

19 A Yes, sir.

20 Q Is the east channel used
21 as the basis for the winter road to Tuk?

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Dau, O'Rourke, Williams
Cross-Exam by Goudge

1 A I'm sorry, I don't know.

2 Q Do you know, Mr. Dau?

3 Mr. O'Rourke? Suppose with me that it is, does that
4 inhibit your ability to make an ice bridge across that
5 road?

6 A The river channel itself
7 is used as a winter road to Tuk?

8 Q Assume with me that that
9 is so.

10 A I wouldn't think so. I
11 would suppose that they would stay fairly close to
one shore if they are following the river.

13 Q Have you given any
14 thought to an ice bridge crossing an ice road?

15 A No sir.

16 Q Does that strike you as
17 a problem beyond solution? I take it not. A clover-
18 leaf of some kind.

19 A I can't see it as a
20 problem. Maybe I haven't thought about it enough though,
21 Mr. Goudge.

22 Q I'm also advised that the
23 east bank of the river at that point is relatively
24 steep. Are you familiar with that?

25 A Yes sir.

26 Q In your estimation would
27 a cut be necessary on that bank to get the heavy
28 equipment up the bank?

29 A I'm sure that a shoe
30 fly or a --

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1 Q A what?

2 A A shoe fly.

3 Q I hesitate to ask, but
4 could you describe that for me? Does it look like
5 either a backhoe or a roam-type blade?

6 A It's a pipeline term
7 for an access road that diverges from the right-of-
8 way to get equipment, particularly wheeled equipment,
9 over some difficult terrain. The seismic crews use
10 it all the time to go around boggy areas and so
11 forth, and I think in this case that a temporary
12 winter road would be considered up the valley of the
13 Holmes Creek.

14 Q I take it you would
15 not recommend the making of a cut in the east bank
16 in order to get that machinery up the slope at the
17 point of the right-of-way.

18 A Not solely for the
19 movement of equipment. In the construction of the
20 river crossing, I think there is some cut grading
21 contemplated there.

22 Q Yes. As a general
23 matter, Mr. Williams, is there any limit to the
24 slope that a winter road can have before machinery is
25 not able to scale it?

26 A We have tried to answer
27 that question, Mr. Goudge, in one of the responses
28 to the Assessment Group.

29 Q Do you recall the answer?

30 A The statement says that

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1 the maximum gradient along the right-of-way on a
2 snow or ice road working surface for conventional
3 wheeled vehicles hauling heavy loads is about nine
4 degrees or 16%. I think without reading it all, that
5 we go on to say that:

6 "Where gradients exceed conventional truck
7 traffic limits, tow tractors or temporary
8 diversions may be used,"
9 and I'm sorry, that response to the Government Assess-
10 ment Group question No. 18.

11 Q So beyond that limit
12 you would intend not to cut but to use either tow
13 tractors or another route.

14 A Did you say not to
15 truck?

16 Q Tow tractors.

17 A The tow tractors would
18 be to assist other equipment up the hill, such as
19 trucks.

20 Q Yes. Now going back
21 to the map, Mr. Williams, one last thing that concerns
22 me about it is this. I take it that the camp that
23 we've moved once already during that first winter
24 has to move again during that first winter to site
25 M-02.

26 A Yes sir.

27 Q That is a move from
28 M-01 to M-02 that occurs near the end of that first
29 season.

30 A Yes sir.

Dau, O'Rourke, Williams
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1 Q And I take it for that
2 purpose that a snow road would have to be built between
3 those two sites.

4 A Yes sir.

5 Q That means that insofar
6 as this map is concerned, that first season would see
7 a snow road from Milepost 00 to Milepost --

8 A 95.

9 Q -- 95, thank you. That's
10 correct, is it?

11 A Yes sir.

12 Q Construction would go
13 as far, though, as approximately Milepost 59.

14 A Yes sir.

15 Q In the first winter.

16 A If you have good luck,
17 good weather, and the pipe available, you would pro-
18 bably go --

19 Q You'd go as far as you
20 could, but the schedule calls for you to go as far as
21 Milepost 59.

22 A Yes sir.

23 Q I take it then that
24 at the beginning of the second construction winter
25 you would pick up the operation at Milepost 59.

26 A Again, as we discussed
27 before, it doesn't have to start there. It can be
28 --

29 Q You could start --

30 A -- at the camp.

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1
2 Q -- at Milepost 95 and
3 move backwards again.

4 A Or reverse the side of
5 the right-of-way.

6 Q Or reverse the side of
7 the right-of-way.

8 A Yes sir.

9 Q Yes. In any event,
10 during that second winter the snow road would have to
11 be re-laid between Milepost 59 and Milepost 95.

12 A Yes sir.

13 Q So that you would have
14 your full-scale snow road in place again the second
15 winter.

16 A Yes sir.

17 Q I take it you've done
18 no tests where that has been simulated.

19 A Where two snow roads
20 have been --

21 Q Where a snow road has
22 been laid again on the same location a second winter.

23 A We haven't done any,
24 Mr. Goudge.

25 Q Yes. Is this concept
26 of re-laying a snow road for a second winter something
27 that occurs frequently throughout the route down to
28 60?

29 A By rig-movers and geo-
30 physical crews, are you speaking of, Mr. Goudge?

31 Q No, I'm speaking of

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1 the full-scale snow road on the right-of-way necessary
2 to move your heavy equipment.

3 A Yes, this happens quite
4 frequently in this construction plan.

5 Q In your opinion does the
6 laying of ^{it} a second winter increase the potential
7 damage to the surface?

8 A Certainly working any-
9 where doing anything twice increases the potential
10 damage, yes sir.

11 Q Would you estimate a
12 quantification of the increase in damage, is it
13 twice as much?

14 A It's very, in my
15 opinion, very minimal in the first instance, and you
16 double that and it's still pretty small, I think, Mr.
17 Goudge.

18 Q Two times nothing is
19 nothing.

20 A Yes sir.

21 Q In the first winter that
22 area of the snow road, I take it from Milepost 59 to
23 Milepost 95, would be laid near the end of the winter.

24 A Probably.

25 Q Is there a change in
26 snow condition in the end of the winter? I know from
27 skiing that one gets granular snow at the end of the
28 winter. Does that happen in this part of the world?

29 A I think it does at a
30 later time in the season.

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1 Q I'm just curious. Does
2 that affect the snow-making method, the snow-road
3 making method?

4 A I wouldn't see leaving
5 it until springtime when these conditions are liable
6 to occur, Mr. Goudge. It would be done before that.
7 No, I can't see it as a problem.

8 Q Well, dealing with this
9 specific example, Mr. Williams, will any different
10 technique be needed to construct the snow road from
11 Milepost 59 to Milepost 95 at the end of the first
12 winter construction season?

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1 A No, sir, I would not
2 think so. Again, I think this particular area
3 lends itself well to snow accumulation by fences which
4 would at least in part have to be installed fairly
5 early.

6 Q Yes, you may as well have
7 to use your snow making equipment, however?

8 A For that section from
9 59?

10 Q Yes.

11 A It is, I would say, a
12 remote possibility. I would not think so.

13 Q Yes, dealing with your
14 snow making equipment, the Inuvik tests that you
15 used addressed itself to a machine that I think you
16 said produced 12-1/2 thousand cubic feet of snow in
17 31 hours. That was a one nozzle machine, as I understood
18 it?

19 A I think that we had two.
20 Didn't we? We had twin nozzles.

21 Q You referred to a six nozzle
22 machine that you anticipate using?

23 A Yes, sir.

24 Q And I think you
25 said that the proposed capacity of that machine was
26 some twenty times greater than the one that you
27 used in INuvik, do you recall that?

28 A Yes, sir, I think
29 so.

30 Q Yes. Have you made

1 inquiries as to the availability of that kind of
2 equipment?

3 A Yes, sir.

4 Q Could you put a name on
5 the equipment?

6 A The manufacturer that
7 we have been dealing with is Larchmount.

8 Q Yes, and do you have
9 knowledge of the delivery times for that kind of
10 equipment?

11 A Yes, it is not
12 complicated equipment at all, Mr. Goudge, it is
13 available on fairly short notice.

14 Q No major lead times?

15 A No, sir.

16 Q Less than a year?

17 A Yes, sir.

18 Q That equipment I take
19 it has a substantially increased water use capacity
20 because obviously it makes more snow?

21 A Yes, sir.

22 Q Have you developed any
23 rules of thumb as to lake depths that you can
24 use that equipment in connection with?

25 A That -- lake depths that
26 you can extract --

27 Q --water from to put through
28 that kind of equipment?

29 A We have certainly taken
30 into account the report by Aquatic Environments on

1 -- the one that deals with snow removal and thickening
2 of the ice. Similar criteria would apply for extraction
3 of water, except the very, very deep lakes where the
4 amount that we would be extracting would be very a
5 small percentage .

6 Q You would agree that
7 some minimum depth would have to be set for lakes
8 from which water could be taken for snow making?

9 A Are these lakes, are
10 we speaking of lakes with fish in them, Mr. Goudge,
11 or are they --

12 Q Does it make a difference?

13 A I guess it makes a
14 difference in that if the lake is frozen to the bottom
15 it would be pretty to take water out of -- but --

16 Q I agree with that --

17 A I think we have said
18 several times that this procedure is mainly used in
19 the early part of the season before the shallow
20 lakes would be frozen to the bottom.

21 Q Yes, what concerns me,
22 Mr. Williams is the need to avoid taking water from
23 lakes that are too shallow to survive that depletion,
24 would you agree that that is a risk?

25 A It is certainly a
26 consideration.

27 Q Yes. Would you agree that
28 it is necessary to set a minimum depth limit to
29 avoid that risk?

30 A Yes, I think that should be
considered, certainly.

1 Q Yes, do you have any opi-
2 nion as to an appropriate minimum depth?

3 A Not off hand, no.

4 Q I take it that you
5 would rely on your aquatic advisors among others for
6 before coming to that conclusion?

7 A Yes, sir.

8 Q Yes, Snow harvesting
9 is the other method besides snow making and fencing.

10 I take it that you propose snow harvesting only
11 from lakes, not from open areas of tundra?

12 A Lakes or wide rivers --

13 Q Water bodies other than the
14 ocean?

15 A Yes, sir.

16 Q Yes. And I take it
17 that you have made calculations as to the depth of
18 ice thickness necessary to support the harvesting
19 equipment.

20 A Yes, sir.

21 Q And do those calculations
22 apply to permit you to use harvesting of snow from
23 lakes as a method of advancing the snow road production
24 as of November 1 in this particular spread that I
25 have been referring to?

26 A In a normal year I would
27 think so, yes. In a particular cold year it could
28 be earlier than that and in a mild year it could
29 be conceivably later than that. You would have
30 to be very careful.

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1 Q In the example that
2 you used in Inuvik in your test in Inuvik, I understood
3 you to say you used a grader to harvest the snow initially.

4 A To windrow the snow, yes,
5 sir.

6 Q Yes, and the weight of
7 that particular piece of equipment?

8 A I do not have that number.

9 Q Would you anticipate that
10 equipment of that kind could be used in time to
11 assist snow roads being commenced in October and
12 November?

13 A Some modifications may
14 be required, Mr. Goudge such as --

15 Q -- lightening it,
16 perhaps?

17 A Yes, the wheels, possibly
18 changing wheels to tracks to mounting a blade on a
19 track vehicle to spread out the total weight, it
20 is a little better to reduce the concentrated weight.

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Dau, O'Rourke, Williams
Cross-Exam by Goudge

1 A Before leaving the
2 harvest or extracting of water from ponds, Mr. Goudge,
3 just to put it in the proper perspective, you take
4 a lake, and really we're just talking about a slough
5 a quarter of a mile in diameter, to extract six inches
6 of water from that pond produces about 4 1/4 million
7 gallons, and this is sufficient to construct about
8 5.8 miles of snow road with an average thickness of
9 18 inches.

10 Q Mr. Williams, let's
11 both leave snow roads now and turn on to one or two
12 items that I want to conclude with, if I can.

13 A Yes sir.

14 Q Mr. Dau, you spoke in
15 your evidence in chief, I think, about the wharving
16 facilities that will be necessary for this project, and
17 as I understand your application, 20 wharfs will be
18 required, of which five already exist. Is that correct?

19 WITNESS DAU: I'm not sure
20 of the number but I believe that's correct, yes.

21 Q That's what appears in
22 your application, and I take it that the five that
23 already exist will have to be up-graded to support
24 larger shipments than can be accommodated now.

25 A That's my understanding,
26 sir.

27 Q Can you tell us where
28 those five existing wharfs are? Perhaps Mr.
29 O'Rourke can.

30 WITNESS O'ROURKE: I'm just

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1 trying to think for a moment whether the five would
2 include any points along the coast. I don't think so.
3 Assuming that Shingle and Komakuk are not in that
4 five, then the five that I think they referred to
5 would be an existing facility at Swimming Point, there
6 would be Inuvik, Fort Good Hope, Norman Wells, Fort
7 Norman.

8 Q And do you know, Mr.
9 O'Rourke, whether the wharves to be used at those
10 five locations now constitute the only wharf in each
11 of those communities?

12 A I don't have that
13 knowledge in detail, sir.

14 Q Do you have that know-
15 ledge in general?

16 A My impression is that
17 there are established wharves at those named points
18 that Northern Transportation now serves, and that
19 they would require up-grading to handle the kind of
20 volumes that this project has.

21 Q Can you elaborate that
22 concept of up-grading? What does that mean to the
23 wharf? Let's take Good Hope as an example.

24 A I don't feel qualified
25 to do that.

26 Q Will it mean doubling the
27 size of the wharf?

28 A I don't even think I'd
29 want to guess, sir.

30 THE COMMISSIONER: Have you

Dau, O'Rourke, Williams
Cross-Exam by Goudge

1 seen the wharf at Good Hope?

2 A No sir.

3 MR. GOUDGE: Can you help us
4 with that, Mr. Williams? Or Mr. Dau?

5 WITNESS WILLIAMS: I've seen
6 the wharf at Good Hope, yes. It's not much.

7 Q What's it going to be
8 after you're through with it, Mr. Williams?

9 A Well, I think if we
10 look at the strip maps of the construction plan, that
11 the site selected for Good Hope is a mile or two from
12 the Village of Good Hope.

13 Q Do you suggest that an
14 entirely new wharf will be built at Good Hope?

15 A That would be my opinion,
16 yes.

17 Q So that that's not one
18 of the wharves to be up-graded, Mr. Williams?

19 A I would suppose it
20 could be up-graded for a secondary use, Mr. Goudge, but
21 not for the primary location.

22 Q So that you would have --
23 I'm sorry, do you want to add to that?

24 A No, the strip map
25 shows it pretty close to the village, but there's a
26 more detailed sketch that we have in Calgary that
27 suggests that the location is further north, I think,
28 towards the Hare Indian River.

29 Q Can you give me an
30 example of a wharf that will be up-graded, because

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1 I'm interested in getting what I can from you about
2 what up-grading means for these wharves.

3 WITNESS O'ROURKE: I think
4 that we've used the word "up-grading" and "up-rating"
5 in the sense that a wharf would be established at
6 a point that is now served by the barging system.
7 It could very well be that this so-called up-graded
8 or up-rated wharf would be an entirely new wharf over
9 and above whatever facility is there right now.

10 Q I see. What you simply
11 mean is that there would be one of your 20 wharves
12 in the general area where there are now wharfing
13 facilities.

14 A Take Fort Good Hope, it
15 is a regular stop for N.T.C.L. There is a little
16 wharf there, but the facility that would be required
17 for this project would in all likelihood not be an
18 expansion of that wharf, I just don't know because
19 the detail is not yet done; but it could very well
20 be an entirely new facility.

21 Q And I take it that
22 would be true of the other four sites that you spoke
23 of earlier as being those to be up-graded.

24 A Yes sir.

25 Q So that -- I'm sorry.

26 WITNESS WILLIAMS: With the
27 possible exception of Norman Wells.

28 Q Where you would add to
29 an existing wharf,

30 A Or use that facility.

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1 Q Now, taking Good Hope
2 as an example, you say that the chances are that an
3 entirely new wharf will be built. Assuming that to
4 be the case, will that wharf be owned by the pipeline
5 company, or is that a Mr. Horte question?

6 I would think so,
WITNESS DAU: 'I don't know.

7 Q You've made no recommen-
8 dation on that?

9 A No, we have not.

10 Q I take it you've made
11 no recommendation then on who should maintain the
12 wharf over its life.

13 A No. Well, certainly
14 during the use by the project it would be maintained
15 by the project,

16 Q Using Good Hope as our
17 example, have you made any recommendation as to whether
18 the applicant would share the use of that wharf with
19 anyone else?

20 A No, we have not.

21 Q Would your contemplation
22 be that that new wharf would be necessary, could be
23 used by the applicant and because of the applicant's
24 needs, no one else?

25 A you referring to the
26 one at Fort Good Hope still, are you?

27 Q Yes.

28 A In that particular
29 instance I would think that it would be used exclusively
30 by the applicant, since Mr. Williams said, it's some

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1 distance away from the Town of Good Hope.

2 Q Is it generally true that
3 these 20 wharves will be used exclusively by the
4 applicant, or will any be shared with any other unload-
5 ing facilities?

6 A I just don't know, sir.

7 Q Do you know, Mr. O'Rourke
8 whether the logistics of this project call for exclus-
9 ive use by the applican t of these 20 wharves?

10 WITNESS O'ROURKE: We've never
11 included the provision one way or the other in the
12 thinking we did.

13 Q Mr. Williams, do you
14 have a comment on that?

15 WITNESS WILLIAMS: I was
16 wondering, are we speaking about the busy time of
17 the year when the pipe is arriving at this site, or
18 is it three or four years later, Mr. Goudge, when the
19 pipeline construction is completed?

20 Q Would your answer be
21 different for those two situations?

22 MR. MARSHALL: Mr. Goudge, are
23 we talking about a recommendation that N.E.S. is going
24 to make, or what in their opinion would be required
25 for engineering purposes? As I understand the evidence
26 of the panel, the final decisions have, to their
27 knowledge, not yet been made as to ownership and con-
28 trol over the facilities and so on. It's pretty diffi-
29 cult to answer this. If your questions are about
30 engineering requirements and so on, I think they can

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1 answer that.

2 THE COMMISSIONER: Could I
3 just tell all of you and members of the panel that
4 I'd like to know. It may be that somebody will argue
5 here that if this pipeline is built, then the wharves
6 and other facilities necessary for construction but
7 only for limited use thereafter by Arctic Gas, should
8 be dedicated to the use of the community and the public
9 generally after construction is completed. Only Mr.
10 Horte presumably can tell us whether any policy has
11 been laid down in that regard. But in the meantime,
12 during the construction phase, which altogether is
13 about four years if you go from the first winter onto
14 the last winter, during that phase is it N.E.S.'s
15 view that there will be such heavy use made of the
16 wharves for construction purposes that it will
17 not be possible to allow the public to use them?
18 That's what I would like to know.

19 MR. GOUDGE: That's what I
20 was trying to ask, sir. I didn't do it very
21 well.

22 WITNESS DAU: There would be,
23 Mr. Commissioner, / in my view,
24 at certain times during the
25 shipping season, a particular wharf would have very
26 heavy use by the applicant, unloading many bargeloads of
27 pipe and fuel and so forth, and during that time
28 frame -- I don't know what it would be but let's say
29 it was a month -- it would be extremely difficult, in
30 my view, to have multiple use. I can also conceive that
it's a peak effort and then perhaps during the rest of

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1 the year there would be limited shipments arriving at
2 the wharf, and at that time obviously other people
3 could be accommodated. What I want to leave with
4 you is that when it's in use, it's kind of a 24-hour
5 a day operation, everybody flat out and so on. I
6 think it should be, in my view, it would be restricted
7 during that stage; but that does not mean that that
8 is the whole shipping season.

1 Q I take it, Mr. Dau, though,
2 that would likely be at the beginning of the shipping
3 season?

4 A Not necessarily. We
5 utilize the complete shipping season at different
6 locations. In other words our material does not all
7 arrive early in the season and nothing later on in
8 the season.

9 Q I see, so the peak
10 for each particular wharf might be different?

11 A Yes.

12 Q It wouldn't necessarily
13 coincide with what I understand to be the peak for, if
14 you will, other use of wharfing facilities, namely, the
15 beginning of the shipping season, because of resupplying.

16 A It would not necessarily
17 coincide, no.

18 Q Now, have you Mr.
19 O'Rourke, or other members of the panel done any
20 calculations as to, taking Good Hope as the example,
21 now, what numbers we are talking about in peak use
22 periods in terms of tonnages arriving at the wharf?
23 Have you made any calculations of that kind?

24 WITNESS O'ROURKE:

25 A We know the tonnage that
26 would have to go into Fort Good Hope, say, in one season.
27 We have not, in my recollection, defined the use
28 period, if you will, of Fort Good Hope in terms
29 of "X" numbers of days of high use and a lesser or
30 a greater number of days of a lesser use. We

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1 have not plotted that in that kind of detail.

2 Q I take it that some of
3 the twenty wharfs, Mr. Dau, will be located where
4 there are no communities.

5 WITNESS DAU:

A Yes.

6 Q And what kind of information
7 will you recommend the applicant have before precisely locating
8 those wharfs at non-community sites, any land use
9 information?

10 A Yes, that would certainly
11 be considered.

12 Q Would you recommend the
13 consulting of local hunters or trappers before locating
14 wharfs at non-community sites?

15 A Yes, that should be
16 done.

17 Q It has not been done to
18 date, I take it.

19 A It has not been done to
20 date. Not by Northern. I am not sure how much
21 information Northern Transportation has gathered on
22 some of these potential sites. We have discussed the
23 location, as I understand it, with Northern Transportation
24 some time ago. They may have such information.

25 Q There is no doubt though
26 that the applicant will be the final arbiter of
27 site selection for those wharfs?

28 A That is correct.

29 Q And you would contemplate
30 that these sites not near communities would have the

1 same kind of continuing use over the life of the project
2 insofar as the pipeline company is concerned as those
3 wharfs at communities?

4 A Yes.

5 Q And that kind of
6 use concerns the support for compressor stations,
7 communications towers and so on?

8 A Yes.

9 Q That use, would, I think,
10 or would you agree, never involve such quantities as
11 to prevent shared use of the wharfing facilities by
12 others.

13 A No, the peak would be
14 during the pipeline construction phase.

15 Q And it is really only during
16 the pipeline construction phase that usage is such
17 as to prevent shared use of wharfs?

18 A That would be my view,
19 certainly at the time you are building or moving
20 in the equipment to build the compressor station there
21 will be a peak usage at that site, but it in tonnage,
22 it is not the same as the pipeline construction phase.

23 Q Now, while we have the Good
24 Hope map out I see , and this is map number 1B-0211-1002,
25 I see a large number of legend items in the Good Hope
26 area. There is a wharf and a stockpile and a major
27 campsite, communications tower and several borrow
28 pits in the very immediate Good Hope area, is that
29 so, Mr. Dau?

30 A Yes.

1 Q Dealing with the stockpile
2 site, I take it that that is a stockpile site to
3 supply what length of route?

4 THE COMMISSIONER: Mr. Goudge,
5 how much longer do you think you are going to be?

6 MR. GOUDGE: I will be as
7 brief as I can, Mr. Commissioner, I would think another
8 15 minutes.

9 THE COMMISSIONER: No, I am
10 not pressing you. While the gentlemen are looking
11 at this map I am going to take a brief adjournment.
12 I have to telephone Vancouver and now I think it is --

13 MR. GOUDGE: That would be
14 helpful to me, sir, I have some specific pieces of
15 information that I can ask them to look up.

16 THE COMMISSIONER: Well, it
17 is 9 o'clock in Vancouver, so people will be in
18 their offices and I can make the call. We will just
19 take a very brief adjournment.

20 (PROCEEDINGS ADJOURNED)
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1 (PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)

2 MR. GOUDGE: When we left
3 off we were talking about the use of the stockpile
4 site at Good Hope to move raw material to certain
5 distances of the right-of-way. Do you have any
6 data on that? How many miles of pipe are stored
7 at the stockpile site there?

8 WITNESS WILLIAMS: 54 miles.

9 Q And is the stockpile
10 site contiguous to the wharf?

11 A Yes sir, that would be
12 the plan.

13 Q To off-load the material
14 at the wharf and take it without necessity of an
15 access road to the stockpile site, it would be that
16 close?

17 A Very short access road,
18 or it could be contiguous, yes.

19 Q And how will the raw
20 material be taken from the stockpile site to its
21 final destination?

22 A As was mentioned yester-
23 day, Mr. Goudge, the construction plan was based on
24 the assumption that the Mackenzie Highway would be
25 in, in operation from the south to Fort Good Hope
26 by the time pipeline construction started. So the
27 material, the pipe and other material that is stock-
28 piled at Fort Good Hope would have to be transported
29 from the stockpile site over a snow road or possibly,
30 we don't show it here, possibly if the Mackenzie

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1 Highway were in I'm sure there would be an --

2 Q An all-weather road?

3 A -- an all-weather road
4 connecting the stockpile site to the Mackenzie Highway,
5 and the pipe that has to be transferred from there
6 to the stockpile site at M-07 would go down the
7 Mackenzie Highway. North of that it would be trans-
8 ported along the right-of-way on snow roads. If the
9 Mackenzie Highway wasn't in, then a snow road on the
10 right-of-way would be utilized.

11 Q Now do you have any
12 information as to the distance between your proposed
13 stockpile site and the present community?

14 A Approximately two miles.

15 Q Do you have any infor-
16 mation on the distance between the road you propose
17 from the stockpile site to the highway and the community?

18 A It would run pretty well
19 directly from the stockpile site to either the
20 Mackenzie Highway or the right-of-way, thereby avoiding
21 the village by about two miles.

22 Q By about two miles. Now
23 the construction necessitated around that community
24 entails the introduction of large number of crews to
25 that area, is that so?

26 A Yes sir.

27 Q There will be crews
28 necessary to up-grade the wharf or build a new wharf,
29 as you say, to build the stockpile site, communications
30 tower, the camp facility and so on.

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1 A Yes sir.

2 Q Do you have any infor-
3 mation as to the numbers of men that will involve
4 beginning with the first summer, for example?

5 A Well, for the construc-
6 tion of the wharf and the stockpile site, we envision
7 a crew of between 50 and 100 people. When the main
8 construction -- if the main construction camp were
9 located there, as suggested in this plan, the winter
10 camp would peak at probably 7 or 800 men -- people.
11 I should say, Mr. Goudge, that the selection --

12 Q Why did you change your
13 answer, Mr. Williams?

14 A Well, I understand on
15 the Alyeska system that they do have a quota on the
16 pipeline spreads for females, and I would hate to preclude
17 that
/from this project. I beg your pardon?

18 Q I won't ask you to
19 answer the question, Mr. Williams, but let me ask
20 this: How far from the community is the proposed
21 major campsite?

22 A With this plan as shown,
23 Mr. Goudge, the campsite would be adjacent to the
24 stockpile site, which would be about two miles from
25 the village.

26 Q Yes.

27 A I would like to add that
28 when this site was selected, part of the thinking was
29 based on the information that was supplied at the
30 meeting in April of 1973 where the social economy --

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1 Q Those people.

2 A -- socio-economic
3 advisors suggested that this would be a good thing
4 for the Village of Fort Good Hope. I understand that
5 they have done some -- they may have some further
6 information, they may have thought about it some more
7 and they've asked us to look at possible alternatives
8 if it turns out that there is a strong objection to
9 locating these facilities that close to the village.

10 Q Have you done that?

11 A We have done that, sir,
12 and --

13 Q What conclusions have
14 you come to?

15 A -- we find that there
16 is a good possibility that the whole operation could
17 be moved three or four miles further north, that is
18 north of the Hare Indian-Mackenzie confluence.

19 Q Have you made any
20 recommendation to the owner as to that?

21 A No sir, we have just
22 said that this alternative is possible and available.

23 Q In fact, you have a
24 good deal of flexibility as to the location of the
25 major campsite or the stockpile site, or your wharf
26 and so on, isn't that so? At that location.

27 A Did you say that there
28 is a great deal of flexibility available? Well, to
29 move it south would be a bit of a hardship that it
30 would be upstream on the Mackenzie River because the

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1 river and the pipeline right-of-way diverge consider-
2 ably at that point, Mr. Goudge. It would mean sub-
3 stantially more winter road, and of course not too
4 far from there you get into the Ramparts which would
5 be out of the question.

6 Q Moving north doesn't
7 present the same difficulty?

8 A Moving north is not
9 as difficult. It has a disadvantage of taking the
10 camp away from the mid-point of the line. It tends
11 to put it more to one end of the line, but that's
12 not that serious.

13 Q What's the limit of
14 your flexibility to the north, could you move that
15 entire complex ten miles to the north?

16 A The problem is that there
17 are some fairly steep banks along there, Mr. Goudge,
18 and that presents a problem, not for the wharf site
19 itself but for getting the pipe from the wharf to
20 a suitable stockpile site which would probably be
21 located above the embankment.

22 Q You've determined,
23 though, that at least four to five miles to the
24 north presents no problem.

25 A It is a good possible
26 alternative, yes sir.

27 Q I take it that major
28 campsite is in use only in the first construction
29 winter.

30 A Yes sir, only part of the

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1 first construction winter. It moves.

2 Q When is it proposed to
3 move it?

4 A With this schedule we've
5 shown, it moves to compressor station site M-07 in
6 February.

7 Q Having commenced when?

8 A The camp per se would
9 be moved in in the barging season, and would be set
10 up on the stockpiles or on the campsite adjacent to
11 the stockpile site --

12 Q And manned
13 At the beginning of the
14 construction season?

15 A The major manning would
16 be at the beginning of construction, yes sir.

17 Q Now in the second
18 summer will there be a building crew or a stockpile
19 manning crew at the stockpile site?

20 A Certainly not for pipe.
21 I'm not sure of the requirements for compressor
22 stations.

23 Q Do you have that infor-
24 mation, Mr. Dau? Approximately, I'm not interested
25 in specifics.
26
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1 WITNESS DAU:

2 A That would be much later,
3 sir, that is one of the stations that is built in
4 the third operating year.

5 WITNESS WILLIAMS:

6 A And Mr. Dau is referring
7 to compressor station M- 07.

8 Q I understand that. Does
9 that mean that the stockpile site would be manned only
10 very marginally in the second summer?

11 WITNESS DAU:

12 A I would think so, yes.

13 Q And during the second
14 summer apart from your stockpile crew do you propose
15 that the owner have any other employees in the Good
16 Hope area?

17 A There is a communication
18 tower to be installed there and I am not sure when
19 that is installed, but that would be a very small
20 crew of half a dozen people for just a few days.

21 Q I see. Now, Mr. Dau,
22 moving on to what your proposals tell us concerning
23 aircraft, as I understand you, you propose that the
24 applicant use existing major airstrips at Inuvik,
25 Norman Wells, Fort Simpson and Hay River?

26 A Yes.

27 Q And the number of smaller
28 airstrips along the right-of-way as well?

29 A Yes.

30 Q And you propose to build

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1 five 6,000 foot airstrips and sixteen 2,400 foot
2 airstrips along the right-of-way, that is contained
3 in your application, is it not?

4 A Yes.

5 Q And my reading of that
6 indicates that eight of the shorter airstrips and all
7 five of the longer airstrips are to be built on the
8 right-of-way north of 60?

9 A Adjacent to the
10 right-of-way -- not on the right-of-way.

11 Q Yes.

12 A Yes.

13 Q Do I have my numbers
14 right?

15 A I do not have an
16 exact list here, but that sounds right, sir, yes.

17 Q Yes, perhaps you could
18 check and if it is not you could advise us next
19 time.

20 A Right.

21 Q You have said I think
22 as well that you intend to upgrade the airstrips
23 at Fort Norman and Fort Good Hope and Wrigley?

24 A Yes.

25 Q Once again, can you
26 give me any help as to what you mean by upgrading?

27 A My note says that they
28 will be upgraded to a length of 2,400 foot minimum.
29 They would be a STOL type landing strip.

30 Q And would your plan call

1 for the applicant to undertake that work on his own
2 rather than with any financial assistance from
3 any government authority?

4 A Our cost assumptions
5 have been that it is a cost of the applicant, but
6 you would have to talk to the applicant about those
7 arrangements.

8 Q Your plan calls for
9 it to be a cost to the applicant?

10 MR. MARSHALL: Well, I think
11 that their capital cost estimates have been developed
12 on the conservative basis that he has indicated as
13 to whether or not arrangements have been made between
14 the company and the Government --

15 MR. GOUDGE: We have a
16 panel next week.

17 MR. MARSHALL: -- will have
18 to look elsewhere.

19 MR. GOUDGE: You can come
20 back next week.

21 Q Now, is it also a
22 part of upgrading, Mr. Dau, to add to the technical
23 facilities of those airstrips. By that I mean adding
24 things like approach path indicators and lighting
25 systems and so on.

26 A They would be
27 equipped the same as the other strips that the
28 applicant would construct, so if that means upgrading
29 the existing facility in that sense, well, it would
30 be done, yes.

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1 Q Do you know whether the
2 other strips are to be upgraded in the sense I speak
3 of or not?

4 A I am sorry, I am referring
5 to just new strips that the applicant builds.

6 Q Yes.

7 A They would have the
8 same standards.

9 Q And do you know whether
10 those standards include visual approach path indicators?

11 A I cannot find that
12 right now, sir, it is my understanding that they --
13 that these strips will be instrumented for instrument
14 flying, if you will. I could try and get the precise
15 details for you. I just do not have it here.

16 Q I would be grateful if
17 you would. And I take it your plan calls for the
18 use of helicopters from camp sites to short length
19 airstrips, the use of STOL aircraft from short length
20 to the 6,000 foot airstrips and thereafter larger
21 aircraft to move the men back and forth, is that
22 so?

23 A Yes.

24 Q Can you help me by
25 indicating if you have any information as to, in a
26 typical month of construction, the number of STOL
27 aircraft flights that would take place to move the
28 men in any given spread?

29 WITNESS O'ROURKE:

30 A I do not know if we have

1 the detail to respond to respond to that particular
2 question.

3 MR. MARSHALL: Perhaps it is
4 something that they could check, Mr. Goudge.

5 MR. GOUDGE: Let me ask one
6 other question and leave it with you if I can.

7 Q Will you have a specific
8 number of STOL aircraft attached to a given spread?
9 And if so, how many flights will it make in moving the
10 men back and forth in a typical month in either
11 construction season?

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1 But you can perhaps get
2 that and supply it to us. Now, Mr. Dau, in looking
3 at the highway and stockpile configurations near the
4 Fort McPherson-Travaillant Lake area, it appears to
5 me that there is a stockpile site in or at least very
6 near Fort McPherson. That appears on drawing 1 E-0211-
7 1001.

8 Yes sir,
WITNESS DAU: / About six or
9 seven miles north of the community.

10 Q And from where will the
11 material come to that stockpile site? I don't see a
12 wharf naturally associated with it.

13 WITNESS WILLIAMS: We're speak-
14 ing of ^{river} Milepost 950, Mr. Goudge?

15 Q We're speaking of the
16 stockpile site that Mr. Dau just referred to.

17 A My map shows a square
18 there that's partly obliterated by the triangle, the
19 square denoting the wharf, and the triangle the material
20 stockpile site. It doesn't look too clear, but if
21 you look at the drawing next to it, 1 C-0211-1002, it
22 shows it a little clearer, I think.

23 Q Is the contemplation that
24 that is a wharf and it would be used to feed that
25 stockpile site?

26 Yes sir,
A / It shows 35 miles of
27 pipe delivered to that location.

28 Q From that wharf, is that
29 the intention?

30 A Yes sir.

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1 Q I notice the Dempster
2 Highway looming not too far from that stockpile site.
3 Might it also be that the stockpile site would be
4 fed from the Dempster Highway?

5 WITNESS O'ROURKE: WE've
6 considered that stockpile site to be fed either way.
7 I lean towards discharge in the Arctic Red River
8 area and trucking across.

9 Q There is a stockpile
10 site in addition to the one right at river Milepost
11 950 about an inch below on that map, that I referred
12 to, 1 E-0211-1001. Can you find that, Mr. Dau?

13 WITNESS DAU: Yes, I see it.

14 Q Is that stockpile site
15 to be supplied by the wharf at Fort McPherson?

16 A I'm not sure why it's
17 there, sir. I can't visualize why it would be used.
18 Can we check that and let you know?

19 Q Yes, it's a mystery to
20 us and we'd be grateful for your advice. Lastly
21 then, Mr. Dau, going back to Good Hope, you said
22 earlier that if the Mackenzie Highway were built it
23 would be used to transport material from the stockpile
24 site to the right-of-way. If the Mackenzie Highway
25 is not built, will that involve any re-location of your
26 wharf facilities or your stockpile site at Good Hope?

27 A In that event we would
28 have to re-assess the plan. As you can see, there are
29 no landing strips at the compressor stations, for
30 instance, but without a highway we would have to

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1 install landing strips at those stations, and I'm sure
2 that in the re-assessment of the overall plan that
3 some of the stockpile sites would move.

4 Q Those plans have not been
5 laid out as yet, I take it.

6 A No, they have not.

7 Q Would you anticipate that
8 those plans would entail any change in construction
9 schedule?

10 A Not in the overall timing
11 and not -- I'm sure there would be minor changes but
12 not in the sense that the major work would be done in
13 a different winter season or anything like that. I
14 would think they would be very minor changes.

15 Q A matter of a day here
16 or a day there?

17 A Well, it would affect
18 obviously the construction schedule for the construction
19 of landing strips, for instance. There would probably
20 be more of them.

21 Q Have you finished?

22 A Yes.

23 Q I was waiting for more
24 what, more landing strips?

25 A I'm finished, sir.

26 MR. GOUDGE: Well, I'll never
27 know. I've no more questions.

28 MR. SCOTT: Mr. Lucas had some
29 questions he wanted to ask, and this would be, I think,
30 a convenient time.

Dau, O'Rourke, Williams
Cross-Exam by Lucas

1 MR. LUCAS: Mr. Commissioner,
2 I have a few additional questions and then after that
3 Mr. Scott can have a clear field.
4

5 CROSS-EXAMINATION BY MR. LUCAS (CONTINUED):

6 Q Mr. Dau, I'd like to
7 refer you to the applicant's responses to the Pipeline
8 Application Assessment Group's requests for supplemen-
9 tary information, it's the orange volume, Exhibit 70,
10 Mr. Marshall.

11 MR. MARSHALL: Yes, I have it.

12 MR. LUCAS: On page 25-4 --
13 25-3 and 25-4, the applicant lists a series of off-
14 setting measures that might be taken in the event for
15 one reason or another the construction schedule as
16 proposed actually -- that is in the event that con-
17 struction actually falls behind the schedule that
18 has been proposed and item "C" is the one I'm parti-
19 cularly interested in on the top of page 25-4:

20 "Crews can be augmented with additional men
21 and equipment to accelerate the schedule."
22 What I'm interested in, Mr. Dau, is whether you have
23 actually developed contingency plans to deal with
24 augmenting any particular spread with men and equipment
25 in any particular construction season. Have you done
26 that?

27 WITNESS DAU: No.

28 Q Will you be doing that?

29 A Yes, I'm sure that
30 those contingency plans would be developed at a much

Dau, O'Rourke, Williams
Cross-Exam by Lucas

1 later stage. In my view it would be part of the detailed
2 construction planning that would go on.

3 Q What I'm getting at, Mr.
4 Dau, is where does this additional men and equipment
5 come from?

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1 A Well, obviously they
2 would -- they would be using the same sources as we
3 did for the main crew. It would be a labour pool with-
4 in Canada.

5 Q Well, does that mean,
6 Mr. Dau, that if a particular spread falls behind
7 its schedule in a particular construction season, you
8 would attempt to augment that spread by bringing
9 up additional men and equipment from the south?

10 A That is one of the
11 alternatives. Yes, we could -- you could increase the
12 size of the crews, yes.

13 Q How would you do that
14 during the winter after the close of the shipping
15 season?

16 A With people?

17 Q I am speaking of heavy
18 equipment.

19 A Oh, I am sure that the
20 major amount of additional equipment that would be
21 required would be on site. The other possibilities
22 would be that you could borrow some equipment from
23 other spreads. This does not mean that we are trying
24 to double the crew or double the equipment or anything
25 like that, in my view it is not a very large item.

26 Q I am just wondering,
27 MR. Dau, whether this offsetting measure in response
28 number 25 is really a seriously thoughtout measure or
29 whether it was simply a random thought in the head of
30 the person who prepared response number 25. Now, you

1 say that equipment may be available from other
2 spreads. That could mean, could it not, attempting
3 to move heavy equipment several hundred miles.

4 A I could not visualize
5 that happening, but certainly it could involve moving
6 some equipment some distance, I am not sure of this
7 700 miles.

8 Q Now, this additional
9 equipment that may be available on other spreads,
10 would this not be the standby equipment that is
11 being held in reserve in the event of breakdowns?

12 A That would be part of
13 it. The equipment lists that we have prepared include
14 a lot of stand by equipment and it is there of
15 course for contingencies for equipment that is broken
16 down and it also is there for just this purpose, that
17 we would not want to move in large quantities of
18 equipment at the last minute. I think that we have
19 a conservative equipment list. There is more than
20 you would normally have.

21 Q To the extent, though,
22 that you go to this particular offsetting measure, that
23 is moving equipment from other spreads, you thin out
24 the reserve equipment on the other spread, do you
25 not?

26 A That is true,

27 Q Turning now to the
28 question of fuel supplies necessary. I believe the
29 section 13A reference would be 13A-6.4.8 .

30 Earlier in this section, I believe and in your direct

Dau, O'Rourke, Williams
Cross-Exam by Lucas

1 testimony, the quantities of fuel required were indicated.
2 AT the top of page 38 it is indicated that the fuel
3 supply will be transported to barge sites along the
4 Mackenzie River or the Beaufort Sea primarily by
5 barge. Where practical the fuel will be pumped directly
6 from the barge into the storage tanks.

7 Now, the storage tanks are
8 located at the stockpile sites along the river that
9 have been indicated on the route maps, is that
10 correct?

11 A Yes.

12 Q And the tanks then will
13 be located on the river bank in most cases?

14 A Adjacent to the river,
15 yes.

16 Q Have you developed as
17 part of your construction plan detailed fuel handling
18 procedures for moving the fuel into the barges and
19 particularly for the operation of pumping the fuel
20 out of the barges and into the storage tanks?

21 The question is, have you
22 developed specific fuel handling procedures?

23 A Not at this stage, no
24 sir.

25 Q Will you be doing so?

26 A Yes.

27 Q On this matter of
28 fuel handling procedures have you consulted the
29 Department of Indian and Northern Affairs, Land Use
30 Section, which has responsibility for oil spill con-
tingency matters?

Dau, O'Rourke, Williams
Cross-Exam by Lucas

1 A No, I have not.

2 Q Will you likely be doing
3 so?

4 A Yes, I'm sure we will.

5 Q With respect to the stor-
6 age tanks, Mr. Dau, have you developed any guidelines
7 as to the set-back from the river for the storage
8 tanks?

9 A No, I don't -- no, we
10 have not.

11 Q So you can't tell us
12 now where any particular set of storage tanks would be
13 located precisely.

14 A No, I cannot.

15 Q And this is a matter for
16 final design.

17 A That's right, sir.

18 Q Turning rather reluctantly
19 for a few moments back to the question of snow roads,
20 Mr. Williams, --

21 WITNESS WILLIAMS: Yes sir.

22 Q And referring specifically
23 to the North Slope section of the line, Prudhoe Bay
24 lateral, would you anticipate having to use artificial
25 snow to construct your snow roads in that region al-
26 most entirely?

27 A No sir.

28 Q Do you anticipate a
29 situation in which perhaps the bulk of the snow used
30 in the snow road would be artificially made?

Dau, O'Rourke, Williams
Cross-Exam by Lucas

1 A No sir.

2 Q What then are you going
3 to rely on?

4 A Accumulating -- I men-
5 tioned several times, I think, that in this particular
6 area that you're talking about, it lends itself well
7 to snow accumulation by snow fencing.

8 Q And so --

9 THE COMMISSIONER: Did you say
10 artificial snow at some stage?

11 MR. LUCAS: Snow-making, Mr.
12 Commissioner, a ski slope apparatus Mr. Goudge is no
13 doubt familiar with.

14 Q Mr. Williams then, is
15 it entirely inconceivable that there could be a very
16 low precipitation season in which you would find
17 yourself relying primarily on manufactured snow?

18 A Certainly the area
19 generally speaking, is an area of very low precipita-
20 tion, Mr. Lucas.

21 Q So that's a possibility.

22 A But I don't think there
23 is probably any history of no precipitation, and snow
24 does fall, and it does blow, and it can be accumulated
25 by snow fences.

26 Q Mr. Williams, are you
27 aware of the fact that the Alyeska Pipeline Company
28 has recently been relieved of a commitment that it
29 had made previously to rely on snow roads for construc-
30 tion of sections north of the Brooks Range in Alaska?

Dau, O'Rourke, Williams
Cross-Exam by Lucas

1 A No sir.

2 THE COMMISSIONER: Relieved
3 by?

4 MR. LUCAS: By the relevant
5 U.S. regulatory authorities, sir.

6 Q Just one more question
7 with respect to snow roads, Mr. Williams. You referred
8 earlier in response to Mr. Goudge, I believe, to a
9 maximum grade on the snow roads of nine degrees, is
10 that correct? A 16% grade.

11 A That was, I think, the
12 maximum grade that could be readily handled with
13 wheeled traffic, Mr. Lucas.

14 Q Mr. Williams, in any of
15 these snow road tests you have carried out, have you
16 attempted to determine whether a heavily loaded truck
17 would encounter difficulty manoeuvring down a grade
18 in the order of nine degrees?

19 A Yes sir.

20 Q And what have you
21 discovered?

22 A That at the snow road
23 test at Inuvik we did have such grades and we did not
24 have serious problems.

25 Q You didn't encounter
26 any jack-knifing of vehicles and so on?

27 A No, we didn't.

28 Q These were heavily
29 loaded vehicles, I assume.

30 A Yes sir, 25 to 30, I

Dau, O'Rourke, Williams
Cross-Exam by Lucas
Cross-Exam by Scott

1 think, 35-ton tare weight, loaded -- loads.

2 Q Carrying loads in the
3 same order that would be carried by the vehicles bring-
4 ing the -- moving the pipe from the stockpile sites.

5 A Yes sir.

6 MR. LUCAS: Thank you, sir.
7 Those are all the questions I have.

8 THE COMMISSIONER: Well, we'll
9 adjourn for coffee then.

10 (PROCEEDINGS ADJOURNED FOR FEW MINUTES)

11 (PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)

12
13 CROSS-EXAMINATION BY MR. SCOTT:

14 Q Mr. Williams, Mr. Goudge
15 is the expert on snow roads and I seem to be assigned
16 rivers and river crossings as my little territory.
17 I'd like to deal with the crossing at Point Separation.
18 You will remember, as a member of the geotechnical
19 panel, that it was established that the excavation
20 of the twin crossings at Point Separation would produce
21 about 1 1/2 million cubic yards of dredge soil and
22 when we asked the geotechnical panel what was going to
23 be done with that they deferred to this panel and I
24 wonder if you can tell us what you propose to do with
25 all that dredged soil at Pint Separation?

26 WITNESS WILLIAMS: This is the
27 Explorer Hotel/^{high}mound downstream of the channel.

28 Q I think that's the way
29 I've described it.

30 A Yes, Mr. Scott, I've

Dau, O'Rourke, Williams
Cross-Exam by Scott

1 asked Dr. Cooper to look at that in the intervening
2 weeks, and there are several possibilities, alternatives
3 in that respect. He's run out some calculations for
4 doing this excavation work in the summertime, July-
5 August-September sort of months, and if the --

6 Q That has not been put
7 on the ice, I take it we can rule that out, eh?

8 A I wouldn't expect too
9 much ice there at that time, Mr. Scott, no. If the
10 material is dredged and the discharge from the
11 dredge is at the river surface, he calculates that
12 downstream of the excavation the maximum height of
13 the material that would be excavated at Point Separation
14 would be in the order of three feet. If the
15 discharge from the dredge was turned downward so that
16 the discharge was about ten feet above the bed of the
17 stream, a spoil mound in the order of ten feet could
18 remain. The alternative --

19 Q Just if I can stop you
20 there, I don't understand from that description where
21 you're going to put the soil. Does that mean under-
22 water? Below the excavation?

23 A Yes, I'm speaking about
24 the spoil mound that is formed from the dredge
25 excavation procedure which would be deposited downstream
26 of the ditch.

27 Q Yes.

28 A The other alternative
29 to either of those two procedures would be to spoil
30 the material near the shore if it was decided it was

Dau, O'Rourke, Williams
Cross-Exam by Scott

1 required for backfill operations.

2 Q Well, let me see if I
3 can get the alternatives. The first alternative is to
4 put the dredge downstream.

5 A The dredge material.

6 Q The dredge material, yes.

7 A Yes sir.

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Dau, O'Rourke, Williams
Cross-Exam by Scott

1 Q The second is to dispose
2 of it on land in some fashion?

3 A That is an alternative,
4 or near the shoreline in shallower water.

5 Q I take it that in order
6 to put it on the shore it would have to be lifted about
7 100 feet because of the rise from the river at that
8 location?

9 A That would be putting it
10 on top of the embankment --

11 Q Yes --

12 A That was not included in
13 one of the alternatives that I suggested, Mr. Scott,
14 no.

15 Q All right, so we --

16 A This is on the shoreline,
17 below the river bank.

18 Q Yes, I take it that that
19 means for all practical purposes in the river, but at
20 the shore?

21 A That latter alternative,
22 yes, sir.

23 Q And is there a third alterna-
24 tive, that is to replace it, or is that simply un-
25 economic?

26 A To --?

27 Q To take it out and then
28 put it back where it came from?

29 A Utilizing the spoil
30 that would be retained downstream of the ditch line,

1 Mr. Scott --

2 Q Yes --

3 A -- is that the material
4 that you are talking about?

5 Q Yes.

6 A No, it would be the
7 intent to replace some of that material to the ditch
8 line.

9 Q All right, now, as between
10 the two alternatives you or Dr. Cooper have suggested,
11 which does the company regard as preferable?

12 A We really have not studied
13 it in that much detail, Mr. Scott, but I think
14 my preference would be to deposit it downstream of
15 the ditch line and restore some -- put the dredge in after
16 the pipeline was installed and restore some of that
17 material that is available downstream, restore it
18 to the ditch line.

19 Q Is that preference based
20 on economic considerations?

21 A Oh, the detailed con-
22 struction plan would be part of the assessment, the
23 working area required for welding the pipe sections
24 together, the availability of reasonable material for
25 that site --

26 Q But I take it, Mr. Williams,
27 that either of these alternatives involves potentially
28 at least, the introduction of a great deal of material
29 into the river water which will be carried away?

30 A Yes, sir.

Dau, O'Rourke, Williams
Cross-Exam by Mr. Scott

1 Q Have you taken any
2 environmental advice as to which of these two alternatives
3 are preferable from an environmental point of view?

4 A OUR discussions
5 with the fish biologists give us the impression.
6 that because the silt load in the Mackenzie River is
7 so high that the additional material that we would
8 add would not be of serious consequence.

9 Q Well, do I understand
10 then that your environmental advice at this moment
11 is that both are equally acceptable?

12 A I do not recall discussions
13 with them, Mr. Scott, the process of putting some of this
14 material on the shoreline near the bank. The other
15 alternative was certainly discussed with them and
16 they did not indicate any strong reservations with
17 respect to that procedure.

18 Q Yes, I -- can we leave
19 it this way then, that with respect to the first
20 alternative, your judgment is that your environmental
21 advisors have not expressed any serious reservations
22 about it; with respect to the second alternative,
23 you really have not asked them for their views about
24 the second alternative as yet?

25 A Yes, sir.

26 Q Yes.

27 THE COMMISSIONER: Mr. Williams,
28 one of the procedures you outlined was to deposit
29 the spoil on the river bed downstream of each of the
30 two ditches. Well, that would be the backfill. Is there

1 any other way that you would get backfill besides
2 using the spoil from the ditch you dug?

3 A The only alternative
4 that comes to mind, Mr. Commissioner, would be to barge
5 in selected backfill and deposit it from barges.

6 Q Will you deposit the
7 spoil on the river bed downstream of each ditch or
8 whether you deposit it on the river bank or on the
9 land above the river bank, you intended to put that
10 same spoil, to use that spoil as backfill, did you?

11 A There would be a
12 small percentage of it left there for that purpose,
13 but yes, that would be my recommendation, to -- the
14 intent is not to fully backfill the ditch, Mr.
15 Commissioner, to partially backfill the ditch. There
16 would be enough material there to accomplish that
17 partial backfilling.

Dau, O'Rourke, Williams
Cross-Exam by Scott

1 Another interesting
2 number that Dr. Cooper has given us, that at the same
3 time during construction that the Mackenzie River
4 carries a bed load of silty material in the order of
5 10 to 20,000 yards per day, and this is going to be
6 a problem because that will tend to fill the ditch.

7 Q By itself.

8 A After excavation and
9 more than one pass will have to be made at it.

10 Q Well, Mr. Williams,
11 just so we're clear, when you dig this trench across
12 the river, and utilize alternative 1 and place the
13 soil that you dig out downstream, you're not going to
14 go and bring that soil back to fill in the trench, are
15 you?

16 A Yes, that was the intent.

17 Q So the soil is going to
18 be moved within the water twice, once downstream and
19 then a portion of it at least back.

20 A That is one alternative,
21 sir.

22 Q And the other alterna-
23 tive is to take it out and place it on the shore and
24 then put part of it back in the trench?

25 A Yes sir.

26 Q And I take it that in
27 either event there will be surplusage; there will be
28 extra soil that will be not utilized for that purpose?

29 A In the first case it
30 would be very hard to find it, doctor -- Mr. Scott.

Dau, O'Rourke, Williams
Cross-Exam by Scott

1 Q Go ahead, Mr. Williams.

2 A In the second case,
3 we're worried about surplus material now, are we?

4 Q Well, what I am getting
5 at is, is that **the** trench you dig when the pipe is
6 in is going to silt in in the normal course as water
7 goes down the river. You've told us there's a lot of
8 sediment in the water there.

9 A Yes sir.

10 Q So obviously when you
11 come to replace the soil that you've taken out to
12 form the trench, you're not going to need all the
13 soil you've taken out because the trench will be
14 partially filled in.

15 A As I mentioned, a second
16 or possibly a third pass with the dredge will be
17 required to assure that the trench is down to depth
18 when the pipe is pulled into place. As soon as that
19 is done, certainly a natural back-filling will begin
20 to occur. We would like to be assured of five to
21 ten feet of material over the pipe before we leave
22 the job.

23 Q Well, have your people
24 done any studies which reveal what proportion of the
25 soil will be carried away during the period of time
26 when it is moved once or twice under the surface of
27 the water, either to move it out or move it back into
28 the trench?

29 A No, it's very difficult
30 to do that study at this time, Mr. Scott, until we

Dau, O'Rourke, Williams
Cross-Exam by Scott

1 have more drill-holes in the stream bed itself to
2 determine the grain size, the amount of material that
3 will be retained downstream of the excavation is
4 certainly dependent on grain size.

5 Q Well then, I take it it
6 follows that you haven't been able to do any studies
7 as to the potential effects, if any, of this process
8 on the fish and other life of the river.

9 A No, I don't see that
10 that follows, Mr. Scott. The fine materials from the
11 excavation are going to move down the river in suspen-
12 sion. The next coarser materials are going to tend
13 to move down the river as a bed load on the bed, and
14 only the coarser materials will remain.

15 Q But you don't know what
16 the proportions are or what the consequences of those
17 movements are for the life of the river, and you have
18 not been able to do any work to ascertain that.

19 A The numbers that I gave
20 you with respect to the height of the spoil that would
21 be retained after excavation that Dr. Cooper gave me
22 are based on assumed grain sizes, from information, from
23 drill-holes adjacent to the bank and other information
24 that he has; but it's not based on definitive drill-
25 hole information in the stream bed.

26 Q Well now, could I ask
27 you to turn to another crossing diagram, the Swimming
28 Point crossing, which is in the Fort Simpson amendment
29 book, 1-A-0232-1001?

30 THE COMMISSIONER: This is

Dau, O'Rourke, Williams
Cross-Exam by Scott

What was that number again?
Swimming Point.' Oh, here's Fort Simpson, 1044?

MR. SCOTT: It's in the Fort
Simpson book and it's Swimming Point 1-A-0232-1001. It
was the one that was open, Mr. Commissioner.

THE COMMISSIONER: Oh yes,
Swimming Point. I thought you said Fort Simpson.

MR. SCOTT: Q Well now, Mr.
Williams, I take it that similar kinds of problems
are going to arise to be dealt with at this crossing
as well?

A They are similar, Mr.
Scott, but this is one of the two or three locations,
I think that we suggested the berm method of construc-
tion be used, utilizing the shallow water that exists
on the ^{north} west side of the river.

Q No, but I understand that
you're still going to trench through the river bed?

A Yes sir.

Q And would you be prepared
to assume with me that trenching would produce about
600,000 cubic yards of excavation material?

A That sounds reasonable.

Q All right, and what is
going to be done with this excavation material at that
location?

A The way I recall it,
some of the material that is from the detailed plan
that I haven't read for a while, but I think some of
the material is to be deposited on that north-west
shallow water area that we mentioned, and some of it

Dau, O'Rourke, Williams
Cross-Exam by Scott

1 would be deposited downstream from the excavation.

2 Q Well, the shallow area
3 that you've mentioned is in the diagram upper left-
4 hand corner, is that correct? There are four diagrams
5 on the page.

6 A It's shown in the plan
7 view in that area, but the profile immediately under
8 it gives a water depth indication, I think.

9 Q So is it going to be
10 placed in that area in the shallow area to the left.
11 on that diagram?

12 A You're referring to the
13 profile now, Mr. Scott?

14 Q I'm sorry, yes.

15 A Yes, some of it.

16 Q What percentage of it?

17 A I'm sorry, I don't have
18 that number.

19 Q And the rest is going
20 to be put downstream?

21 A Yes sir.

22 Q When will you know --
23 what is the time frame for knowing what the relative
24 proportions are that will be deposited
25 (a) downstream, and
26 (b) in the shallows at that crossing?

27 A Oh, I wouldn't think for
28 a year or so, Mr. Scott, because this is one of the
29 rivers that will change if the cross-delta routing is
30 filed as an amendment.

Dau, O'Rourke, Williams
Cross-Exam by Scott

1 Q And I take it that
2 here, just like at Point Separation, no consideration
3 is presently being given to placing it on land on a
4 permanent basis?

5 A I think that's correct,
6 sir, yes.

7 Q Now, have you had any
8 advice from your environmentalists with respect to the
9 resolution you propose at Swimming Point crossing?

10 A Just the same as I men-
11 tioned before, we have had discussions with respect
12 to all of these river crossings.

13 Q And what do you under-
14 stand their view to be with respect to this solution
15 for the soil at Swimming Point crossing?

16 A I don't recall hearing
17 any strong objections to those plans.

18 Q Well now, I take it
19 that if you look at the profile of that crossing, it
20 reveals that the entire left half of the crossing is
21 to be buried approximately ten feet into permafrost?

22 A Yes sir.

23 Q Yes. Now how are you
24 going to excavate that?

25 A Probably blasting will
26 be required.

27 Q Well, are you going to
28 blast this section of the river, is that what you're
29 telling me?

30 A I would say that blasting

Dau, O'Rourke, Williams
Cross-Exam by Scott

1 will be necessary in the -- where there is permafrost,
2 which would be determined by additional drilling.

3 Q Well, what time of the
4 year is this blasting proposed to be done?

5 A To be done in the
6 wintertime.

7 Q In the wintertime. Have
8 you done any studies to determine what the effects, if
9 any, of that blasting will be on the river life?

10 A Yes, certainly some
11 consideration has been given to that, Mr. Scott, and
12 we've tried to respond to that aspect in one of the
13 questions -- the Assessment Group questions. That's
14 question No. 45, and that response was written jointly
15 by engineers and with -- in consultation with fish
16 biologists.

17 Q Well, are you aware or
18 is the company aware that in that location there is --
19 or near that location there is a commercial fishery
20 operating?

21 A I was not aware of it,
22 sir, and I'm sure our biologists are aware of it.

23 Q Well, apart from your
24 answer to the question, is there in the replies -- have
25 you done any work to assess the impact of this blasting
26 operation on the fishery opportunities, I'll put it that
27 way, in that neighborhood?

28 A We have done no research
29 with respect to blasting in rivers in that particular
30 area, sir. The work that was done was mainly a

Dau, O'Rourke, Williams
Cross-Exam by Scott

1 literature search trying to find the experience of oth-
2 ers in other locations.

3 Q Well now, let me turn to
4 one other matter that was dealt with by the geotechni-
5 cal panel, and I'm going to refer to it as the
6 "Clark crossing", and perhaps you will know what I mean
7 when we recall that the geotechnical panel were asked
8 questions about crossings on the North Slope and their
9 solution for the problems there, was to place culverts
10 above the pipe and across the frost bulb. Do you
11 remember that solution?
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1 A Across the pipe and
2 through the frost bulb?

3 Q Yes.

4 A Was that your wording?

5 Q Yes, I think that it
6 was through the area where the frost bulb will ultimately
7 form.

8 A Yes, sir.

9 Q Do you remember that
10 solution being proposed?

11 A Yes, sir.

12 Q And I take it that the
13 purpose of that solution was to allow the ground water
14 flow to continue uninterrupted across the frost bulb?

15 A Yes, sir.

16 Q And that it was stipulated
17 by the geotechnical panel that it was important that
18 the water should not only continue to flow uninterrupted,
19 but should be relatively free of silt.

20 MR. MARSHALL: Perhaps you
21 could help us with a reference to the transcript.

22 MR. SCOTT: Well, I will
23 leave that out if you are unhappy with it, let me ask
24 you, Mr. Williams, you would agree that if the purpose
25 of this is to maintain the flow of water to permit
26 fish and other life to live it is important that the
27 water flowing be reasonably free of silt.

28 A And we are speaking
29 of braided streams on the North Slope?

30 Q Yes.

1 A I would think that that
2 would have happened naturally, sir, that that water
3 would generally be free of silt, yes.

4 Q Well, taking the Firth
5 River as an example, would you tell us as a construction
6 man how you are going to install these crossings?
7 It is all very well for the geotechnicians to say,
8 all right, Mr. Williams, this is what you are going
9 to have to do, I want to know if you can tell us
10 how you are going to do that?

11 A Yes, sir, it would be
12 done in the winter time when the water depth would
13 be fairly shallow, very shallow, probably. The pipe
14 required for the crossing would be welded up. It would
15 probably be concrete coated. It would be made ready
16 for rapid installation. The excavation would be
17 done, probably utilizing large backhoes for most
18 of it, depending on where the frost, the permafrost
19 depth is and I would think that in that particular river
20 there would be a fair bit of unfrozen material -- a
21 fair depth of unfrozen material under that river. I
22 think that it would be important to excavate that -- have
23 sufficient equipment there to excavate that crossing as
24 quickly as possible and install the pipe quickly
25 and get it backfilled as quickly as possible before
26 things freeze too solidly.

27 Q Well, Mr. Williams, we
28 have heard and the reference is, I will not ask you
29 to look it up, but it is in your responses at page
30 35, I think. We have heard that the frost fall in a

Dau, O'Rourke, Williams
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1 river like that can develop to fifty feet in diameter,
2 let us say. Over a period of time. I take it from
3 thatthat the culverts or the pipes will have to be
4 longer than fifty feet, let us say, 60 or 70 feet
5 in order to carry the water through the frost bulb.

6 A I think you are at the --
7 near the top of the frost bulb it would be lesser than
8 that, would it not, Mr. Scott?

9 Q I am really asking you
10 what length of pipe are you thinking of for the
11 purposes of building these cross drainage culverts?

12 A It would be sufficient
13 to get across the predicted size of the frost bulb.

14 Q Well, is there any problem
15 in your judgement with working with lengths of pipe
16 of fifty to seventy feet?

17 A It is not easy, sir.

18 Q No. And I take it
19 it also follows because of the nature of the streams
20 and the water courses that these culverts will have
21 to be fairly closely placed to assure that the
22 drainage continues as it did in the past?

23 A I do not think that I
24 can comment on that now.

25 Q But I take it that if
26 that is so it is going to lead to a very large
27 excavation?

28 A Yes, sir.

29 Q So that if you are
30 putting in pipes that are, let us say, fifty to

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Cross-Exam by Scott

1 seventy feet long and let us say that you have eight
2 of them fairly closely spaced, you are going to
3 excavate a gigantic area, if that is the model.

4 MR. MARSHALL: Mr. Scott,
5 this witness cannot really comment on that. We
6 are accepting without checking your estimate of the
7 size of the frost bulb, the witness does not have
8 knowledge as to the flows of water that culverts would
9 have to accomodate nor the spacing and I think that
10 Dr. Clark's panel was the one to deal with that
11 subject.

12 MR. SCOTT: Well, Mr.
13 Commissioner, first of all, in the responses at
14 page -- at figure 38-4 a frost bulb is shown
15 diagrammatically which has a width, diameter at the top
16 of forty feet. I am prepared to accept that and
17 I --

18 THE COMMISSIONER: Was
19 that 38, what?

20 MR. SCOTT: 38-4 --

21 THE COMMISSIONER: Figure 38-4.

22 MR. SCOTT: Yes. Do you
23 have that, Mr. Williams?

24 THE COMMISSIONER: It is a given
25 for purposes of the question then, I take it?

26 MR. SCOTT: Yes.

27 THE COMMISSIONER: Can I
28 ask a question, Mr. Scott, just so that I understand
29 what it is Mr. Williams and you are discussing. The
30 pipe coming from Prudhoe Bay from Travailant Lake

1 will be running from west to east and we are, so to
2 speak, on Figure 38-4 looking from west to east or
3 from east to west, which ever way you want to put it
4 and your object is to have drainage from south to
5 north for those streams and rivers that empty into
6 the Arctic Ocean on the North Slope. Now, I have
7 got it, have I? So you are putting culverts from
8 south to north presumably through this frost bulb
9 to facilitate drainage and you are saying to Mr.
10 Williams, well, you go ahead and put it to him,
11 whatever it is --

12 MR. SCOTT: Well, you
13 are not really putting it through the frost bulb
14 because fortunately it is not there presumably when
15 the work is being done, but I take it, Mr. Williams,
16 looking at that diagram you are obviously going to
17 have, for one pass of ground water you are going to
18 have to have a pipe -- let us say -- fifty feet in
19 length, to get across that potential frost bulb area.

20 A I have forgotten ,
21 Mr. Scott, just exactly where Dr. Clark suggested
22 these culverts put in. I was of the impression it
23 was fairly limited use. Now, do you have a different
24 impression?

25 Q I had the impression and
26 I may be wrong that when confronted with the problem,
27 the geotechnical problem, how are you going to assure
28 the flow of this water so that aquatic life can live?
29 He came up with what I call the Clark crossing which
30 is this method of putting culverts across the pipe and

1 they were obviously, I think from the diagrams, a
2 fair length and at fairly close intervals. I think that
3 someone suggested to him at the time that that sounded
4 like the scratchings on the back of a cigarette box
5 and he said, oh, well, the construction people can
6 build that and I simply want to know from a construction
7 person how you are going to build it. It seems
8 to me a terrific task.

9 A Okay, and I presume,
10 Mr. Scott, that you have selected the Firth River because
11 that is one of the rivers that does have aquatic life
12 overwintering downstream of the crossing and
13 they are few in number.

14 Q It is an important
15 river.

16 A Yes, sir. And if
17 you look back a few pages prior to that one, the
18 crossing drawing following page 37-4 which deals
19 with the Firth River, you can see that the river
20 channels are spread over a fair percentage of the
21 active flood plain and I would be surprised if that
22 would end up with eight 50-foot culverts cheek to
23 jowl as you suggest.

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1 Q How many culverts do
2 you think you could put in?

3 A You could fill it up,
4 it's technically possible to fill up the whole river
5 active flood plain with culverts. I don't think it
6 would be necessary, Mr. Scott.

7 Q Well, is there any way
8 of telling, for example, how many culverts you would
9 intend in that situation?

10 A I couldn't answer that,
11 no.

12 THE COMMISSIONER: I take it if
13 you don't get them in before the bulb becomes estab-
14 lished, and that it turns out you need to put them
15 in, I presume that that creates some problems you'd
16 rather not have to face.

17 A Yes sir, it would be
18 much more difficult to install them at a later date.

19 MR. SCOTT: Q Mr. Williams,
20 wouldn't it be impossible to install them at a later
21 date?

22 A I wouldn't want to do
23 it without de-pressuring the line.

24 Q You'd really have to
25 blast the frost bulb, which would risk the security
26 of the pipe..

27 A Oh, it would be possible
28 to do it by other means, but very difficult, Mr.
29 Scott.

30 Q Yes, so that I take it

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1 that the extent to which you have to put more than one
2 culvert, greatly increases the complexity of the work
3 and greatly increases the dimension of the excavation.

4 A Yes sir.

5 THE COMMISSIONER: May I ask
6 a totally irrelevant question?

7 Q Is El Paso's proposal
8 -- if you know the answer to this -- to bring natural
9 gas from Prudhoe Bay south through the utility corri-
10 dor to Valdez, do they say that they will drill the
11 gas through permafrost?

12 WITNESS DAU:

13 A Yes sir, I understand
14 it's for approximately half of the distance involved.

15 Q So they would have the
16 frost bulb thing to contend with themselves.

17 A That's right. Mr. Scott,
18 can I muddy this up a little bit? I wasn't here
19 at the last panel.

20 MR. SCOTT: Well, a fresh view
21 will certainly help, Mr. Dau.

22 A I can't agree with you
23 that this is an enormously difficult construction
24 problem. First, I don't know the size of the culvert.
25 I assume, I'm talking about the diameter, not the length.
26 It's my understanding that it's an insulated culvert
27 which to my view means that it's -- it would obviously
28 be steel pipe with some insulation and probably encased
29 with a steel jacket. If it's 50 or 60 feet long, that's
30 not an unusual length to handle. It can be handled
with the equipment we have there. On the particular

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1 drawing that you're looking at which is figure 38-4,
2 it's my understanding that the culvert is installed
3 above the pipe so the excavation that you're talking
4 about for one individual culvert is a relatively short
5 cross-excavation and not at a great depth, that -- well
6 on that particular drawing it would appear to be from
7 the river bed probably would only involve excavations
8 in the order of five feet, say, 5-6 feet, and I don't
9 think that's a terribly difficult construction problem.
10 It certainly involves additional excavation.

11 THE COMMISSIONER: Could I
12 ask a question? Sorry to interrupt, Mr. Scott.

13 Q Is there anywhere in the
14 construction plan an indication of how much steel
15 pipe will be needed for the culverts through the frost
16 bulb? Is there any indication how many culverts there
17 will have to be and is there any indication --

18 A I think not, sir.

19 Q Just reverting to my
20 earlier irrelevant question, El Paso is of course not
21 under the jurisdiction of any Canadian tribunal, as
22 their line is being built through Alaska; but have
23 they filed -- is El Paso -- I'm not asking anybody to
24 answer this but maybe it could be pursued -- has El
25 Paso filed, made filings with the Federal Power
26 Commission or with the Department of the Interior
27 that would indicate whether it has separately
28 considered, separately apart from Arctic Gas and
29 N.E.S., the frost bulb problem? I know that if you
30 were appearing now before the F.P.C., Mr. Marshall,

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1 you'd dismiss the whole notion that they had anything
2 worthwhile, but it just occurred to me that they
3 might have filed something. They might have had their
4 own scientists working on this frost bulb problem.
5 Well, at any rate maybe --

6 MR. HOLLINGWORTH: I can
7 certainly undertake to find that out from some sources
8 I have.

9 THE COMMISSIONER: Thank you,
10 Mr. Hollingworth.

11 MR. SCOTT: Well, I just
12 propose to leave the North Shore crossings now,
13 secure in the knowledge that when and if it is done,
14 and there are difficulties, Mr. Williams will be able
15 to say to Mr. Dau, "Well, I told you so."

16 Don't forget that, Mr.
17 Williams, you may need it.

18 WITNESS WILLIAMS: I said
19 "difficult", Mr. Scott, not impossible.

20 MR. SCOTT: I see.

21 MR. MARSHALL: Mr. Scott,
22 if I might just before you go on, the mention was made
23 again of Alaska. Earlier this morning there was a
24 statement made by Professor Lucas about snow roads
25 on the Alyeska project, and on checking that during
26 the break I find that our information seems to be
27 that there were never any snow roads proposed for
28 use on the Alyeska project, and I wonder if perhaps
29 Professor Lucas might at a later date clarify that?

30 MR. SCOTT: Any snow roads, or

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1 few?

2 MR. MARSHALL: I am instructed
3 that their proposal didn't call in the first instance
4 or at all for any snow roads.

5 MR. LUCAS: I'll undertake
6 to check that with our consultant, who is in fact one
7 of the consultants for the governmental agency over-
8 seeing the construction of the Alyeska line.

9 MR. MARSHALL: Thank you.

10 MR. SCOTT: Q Well now, let
11 me turn to some questions I have that relate to
12 conventional and Arctic construction techniques. I
13 understand from reading the prepared evidence and the
14 evidence in chief that conventional winter construc-
15 tion will be applied in non-permafrost areas in the
16 first place. Is that correct? You'll use conven-
17 tional techniques, and that the technique generally
18 involves grading of the right-of-way, cut and fill
19 methods, removal of the snow to induce freezing of
20 the ground except along the ditch line itself.

21 WITNESS DAU: Yes.

22 Q I also understand that
23 the conventional technique in muskeg terrain requires
24 the compression of the vegetation mat with repeated
25 passing of equipment so that freezing will be encouraged
26 to provide a working surface.

27 A Yes, you try to.

28 Q Now that, if I under-
29 stand it, is the conventional construction technique.
30 Let me see if I understand the Arctic construction

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1 technique as you've described it, and I take it that
2 it's intended to be used in sensitive permafrost and
3 erosion areas.

4 A Yes.

5 Q And the technique there
6 is a different one in that what you seek to do, instead
7 of encouraging freezing, is to prevent permafrost
8 regression.

9 A Yes.

10 Q And you do that by
11 building up a working surface above the ground as a
12 kind of insulation instead of scraping or grading
13 as you would do conventionally, you build up a
14 working surface either with snow or with brush or
15 what have you.

16 A Not as an insulator,
17 no. It's a working surface, the intent of the snow is
18 to provide a working surface.

19 Q Yes, but the purpose of
20 building it up is to prevent the regression of the
21 permafrost.

22 A Well, in the long run
23 yes, because if you didn't have the snow working
24 surface you obviously would -- and you went through
25 with conventional techniques, you would destroy the
26 surface vegetation, which then results in regression of
27 permafrost, yes.

28 Q And that substantially
29 is why you do it, isn't it?

30 A Yes, yes.

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1 Q And would it be correct
2 to say that this technique, the so-called Arctic
3 technique, is obviously more expensive than the
4 conventional technique?

5 A Yes, I think it would
6 be more expensive.

7 Q You told Mr. Bayly
8 yesterday that, as I understood the evidence, that
9 you will be able to switch from one technique to
10 another as you move along the route.

11 A Yes, that's possible.

12 Q I take it that it's
13 not only possible, it's what you propose to do.

14 A Yes, certainly in the
15 discontinuous areas.

16 Q I don't know if you
17 told Mr. Bayly this, but perhaps you can tell me, did
18 you give any estimate of the distance over which it
19 would be practical or economic to make this change
20 in construction technique?

21 A Does your question re-
22 late to conventional techniques for ten feet and
23 something else for ten feet? That type of a thing.

24 Q I thought you might
25 tell me that that would be impractical, but what is
26 the dimension of practicality?

27 A I've not thought that
28 through off the top of my head, I'm sure we're talking,
29 that we certainly wouldn't be switching back and
30 forth in areas of a few hundred feet. You would go

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1 with the conventional -- sorry, the Arctic technique
2 in those cases. Now you're going to get obviously
3 into some areas where, in a muskeg area, where you'd
4 want to induce the frost as early as possible, and
5 yet you would want to have the Arctic technique just
6 out off the muskeg. I'm sorry I can't be site
7 specific.

8 Q No, but would it be
9 correct to say that it is possible, in your judgment,
10 to do stretches of three or 400 feet and then alter-
11 nate the technique, and then alternate back, if
12 that should be desirable?

1 A If it had to be done
2 that could be done.

3 Q Yes.

4 Well, now, we have heard a lot
5 about final design and let me see if I understand.
6 What is the time frame between regulatory approvals
7 and the production of final design and specifications?

8 A If we obtained regulatory
9 approvals at the end of the first quarter of 1976 there
10 would be extensive summer programs, and I am referring to
11 north of the 60th parallel, in the summer of '76,
12 survey drilling, ground truth programs that would
13 result in final designs again with respect of the
14 pipeline itself, final designs towards the end of
15 the summer and certainly specifications late -- final
16 design and specifications for those sections
17 late in '76.

18 Q Well, is that about
19 twelve months? Give or take a month or two?

20 A A little less than
21 twelve months, I would say.

22 Q Well, now, I take it that
23 the final design and specifications are going to
24 be based on the ground truth as you call it as
25 you have established it at that time?

26 A The detailed specifications
27 with respect to the techniques which must be used in
28 a particular area are based on ground truth, yes.

29 Q So the process is this:
30 you do your summer work or whatever by way of drilling

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1 and inspection to try and establish the ground truth
2 and having got that data you then go to final design
3 and specifications.

4 A Yes, sir.

5 Q And do I understand
6 correctly that the final design and specifications,
7 always admitting the possibility that there is error,
8 will show the contractor what to build and where?

9 A Yes.

10 Q Yes, now, just so that
11 there will not be any doubt, I take it that when
12 you get on the ground you may find by actual digging
13 that your ground truth is false, that would be only
14 human and you may make a variation.

15 A Yes --

16 Q Is that not so?

17 A Yes.

18 Q But I take it that
19 the design and the specifications will tell the
20 contractor what he has to do?

21 A Yes.

22 Q Now, we have heard
23 from the geotechnical panel who have provided us
24 with a range of problems that may be encountered on
25 the route, running all the way from river crossing
26 problems to slope stability problems to erosion
27 problems and so on. I think that you have read
28 their evidence.

29 A I have read their evidence.

30 Q And they have provided us

1 also with a range of solutions that may, among which
2 a selection may be made to resolve those particular
3 problems.

4 A Yes.

5 Q Well, now, -- and they
6 have also given in their evidence examples of particular
7 problems and how that particular example might be
8 resolved.

9 A That is my understanding,
10 yes.

11 Q And in each of these
12 problems I take it that there is a wide range of
13 variables, the nature of the vegetation, the amount
14 of ground ice, the temperature and a dozen other
15 factors.

16 A Yes.

17 Q Yes.

18 Well, now, is the applicant
19 going to develop any criteria for selecting solutions
20 to be put on final design and specifications?

21 A Yes, I am sure that
22 has to be done.

23 Q Yes, well, when is that
24 going to be done in the timing?

25 A Obviously we have some
26 of that now and we are continuing to work on it.
27 It will be an ongoing process until the time of final
28 design -- the time of issuance of the specifications,
29 yes.

30 Q I take it, Mr. Dau,

1 just so I am sure that I understand what is at
2 stake here, that you have an armory of solutions that
3 your geotechnical people have provided.

4 A Yes.

5 Q And what you have to
6 do by final design is tell the contractor on each
7 hill and valley and crossing which of those
8 solutions is to be utilized there?

9 A Yes.

10 Q And that can only
11 be done by developing criteria that say when these
12 four factors are present you will go to solution A ,
13 when three factors plus another are present you
14 will go to solution B, and so on.

15 A No, that's not quite
16 the way that I visualize it,sir.

17 Q Will you tell me
18 how you visualize it.

19 A Yes, the surveys and
20 field investigation program is going to gather a lot
21 of ground truth so that the design will be placed
22 on the drawings^{which} the contractor will have and it
23 will be specific, he will use these techniques in
24 these areas. Now, if during the course of construction
25 some further information is available, discovered
26 that we had the wrong information and so on, then,
27 there will be people who are qualified to assess that
28 situation and stipulate a particular design for that
29 location, but not on the basis that the contractor
30 has a bag full of options and he has to go out and --

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1 he does not make those decisions. The contractor will
2 not make those decisions.

3 Q Yes, but Mr. Dau,
4 I think what you are telling me is that after final
5 design and specifications, your ground truth may not
6 prove out when you actually get on the site and
7 modification will be required and it will be done
8 under close supervision.

9 A That is correct.

10 Q But I do not -- I understand
11 that and I want to get back to understand how you are
12 going to do the final design so you can say erosion
13 solution A will be used on hill 24 for 50 feet and then
14 10 feet of erosion solution B and then 50 feet of
15 erosion solution C. How are you going to get to that
16 which I understand it is required for final
17 design and specifications?

18 A Well, you get to
19 that stage, sir, by gathering the information, all the
20 detailed information in the field. You would first
21 survey the centre line of the right-of-way. You would
22 determine slopes and cross slopes. You would determine
23 drainage channels and drainage features. You would
24 conduct some drilling programs to determine and
25 confirm the terrain typing that has been done. You
26 try to determine ice contents, for instance in
27 permafrost.

28 Q Well, that is how
29 you get your ground truth.

30 A Right.

1 Q And at the end of that
2 exercise you will have a soil survey of the route which
3 will tell you a great deal about hopefully what is
4 to be found there.

5 A Yes.

6 Q What I am interested in
7 is the next stage. How do the people in your office
8 in Calgary or wherever it is decide what solutions
9 are to be applied to each hill, valley, slope, and
10 expanse of route? Is there a key or a code?
11 Are you developing a code so that you can say to
12 your engineers and draftsmen when we have problems
13 that have the following five characteristics, we
14 will move to solution A or B?

15 A Yes, sir, that document
16 is being prepared and in our terms it is called
17 a design manual.

18 Q It is called a design
19 manual and I take it that that manual is really
20 to provide a code or guide to the people who draw
21 the final design.

22 A That is correct, sir.

23 Q Now, could I ask you,
24 I take it that when that design manual is available
25 you will be able to take the soil survey and the
26 alignment sheets and you will have a pretty good
27 idea of what solutions are going to be used where?

28 A That is correct, sir.

29 Q Yes, when is the
30 design manual going to be available?

1 Not very soon, Mr. Williams is saying if I keep him
2 here much longer.

3 A I would suspect that
4 it is a year away in a final form and I am really
5 reaching for it, I don't know.

6 Q Is there a draft?

7 A Not at this stage, no.

8 Q All right, have any
9 parts of it been completed?

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1 A I'll try and find out
2 for you, sir. I believe some parts have been completed
3 but I'm not positive. I'll find out.

4 THE COMMISSIONER: Has anyone
5 been assigned to begin work on it?

6 A Yes, many people are
7 working on it, sir.

8 MR. SCOTT: You see why I'm
9 interested in it, Mr. Dau, because so many of the
10 questions at this stage must be answered by the
11 answer, "Well, the final design will take care of that."
12 The design manual will be a great help, I think, to
13 this Inquiry in determining how you have coded your
14 solutions for the various problems. Perhaps you
15 can undertake to see what you can find out about that.

16 Q I take it that the
17 design manual will also have a chapter or a paragraph
18 or something on how you're going to key in Arctic
19 construction as opposed to conventional construction
20 techniques.

21 A I'm sure it would, sir.

22 Q And from that manual
23 on this subject, for example, we will be able to see
24 that where the following four or five or eight
25 characteristics are present over a length of a certain
26 dimension, you will move to Arctic construction or
27 alternatively in other circumstances move to conven-
28 tional construction.

29 A That would be possible.

30 MR. SCOTT: Yes.

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1 THE COMMISSIONER: Well,
2 would this be a convenient time to adjourn, Mr.
3 Scott?

4 We'll adjourn until, say,
5 two o'clock.

6 (PROCEEDINGS ADJOURNED TO 2 P.M.)
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1 (PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)

2 MR. SCOTT: Mr. Commissioner,
3 when we were examining the geotechnical panel,
4 we deferred our cross-examination with respect to
5 erosion and related problems on the undertaking of
6 Mr. Genest that Dr. Clark or some expert in that
7 field would be back at an appropriate time. Dr. Harlan
8 is on the panel now and I understand from my
9 friend that Dr. Harlan is competent to
10 deal with those problems. I do not propose to
11 qualify him except to file the --

12 THE COMMISSIONER: Excuse
13 me, has he been sworn?

14 MR. SCOTT: Perhaps he has
15 not been sworn. I do not suppose for a geotechnician
16 it makes any difference, but if we can get Miss Hutchinsons'
17 attention from Mr. Waddel--

18 MR. MARSHALL: Sir, I have
19 a couple of copies of Dr. Harlan's resumé and I will
20 pass them out to the counsel.

21 MR. SCOTT: Our proposition,
22 Mr. Commissioner, is that we do not propose to
23 qualify him. He will be appearing in phase two, if
24 he should appear to be qualified after phase two I
25 am content. If he should not, we could just ignore
26 all the questions that we ask him this afternoon.

27 RICHARD LEE HARLAN, sworn.

28 THE COMMISSIONER: Well,
29 forgive me, this constitutes Dr. Harlan's curriculum
30 vitae?

1 MR. SCOTT: Yes, sir.

2 THE COMMISSIONER: And this
3 is all true, Dr. Harlan?

4 A Yes, it is.

5 THE COMMISSIONER: Well, then,
6 do we need any more than that for now?

7 MR. SCOTT: I do not, no.

8 Q Mr. Dau, before we get
9 to other matters, I am interested in knowing how
10 far north of 60 the conventional method of construction
11 will be used. Before you answer I note that in your
12 prepared evidence it is said on page 8 that it would,
13 that the conventional construction would generally be
14 applied in non-permafrost areas and in the southern
15 fringe of permafrost areas and then in your application
16 it is said in Section 13 A .6.0, construction plan
17 volume, page 27 and I quote:

18 "Generally, south of 65° north latitude, approximately
19 Fort Norman, the occurrence of sensitive
20 permafrost is minimal. In this area
21 therefore it is expected that there will
22 be limited need for Arctic pipeline construction
23 procedures."

24 Now, what am I to understand from that, that conventional
25 techniques will be used south of Fort Norman?

26 WITNESS DAU:

27 A In some areas, yes. I
28 think we have explained that the determination of
29 where conventional winter construction techniques will
30 be used will depend on the ground truth information that

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Cross-Exam by Scott

1 we will be gathering during the survey phase.

2 Q And your key or design
3 manual as well?

4 A Yes, sir.

5 Q Yes. You cannot, I take
6 it, give us any more precise information as to the
7 cut off point for conventional techniques than that?

8 A Not at this stage, sir.

9 Q No.

10 Finally on this subject, or
11 I think finally, I would like to ask you to look at
12 two terrain situations in the southern part of the
13 territories, the southern fringe of permafrost, at
14 least as it is defined in the -- on the permafrost
15 map of Canada.

16 The first is alignment
17 sheet LM-0200-1013, and Mr. Commissioner, that I
18 think is put out before you.

19 THE COMMISSIONER: Oh,
20 thank you.

21 MR. SCOTT: That is an
22 alignment sheet in the Fort Simpson route change
23 volume of the alignment sheets and I think, Mr. Williams,
24 that you and Mr. Dau have that in front of you.

25 WITNESS WILLIAMS:

26 A Yes, sir.

27 Q Now, would you expect
28 to apply conventional methods of construction in this
29 area?

30 WITNESS DAU:

1 A Yes.

2 Q Throughout?

3 A Probably not.

4 Q Now, where would you
5 probably not use conventional methods?

6 A In permafrost with
7 sufficient ice content that would cause degradation of
8 the permafrost.

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Dau, O'Rourke, Williams, Harlan
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1 Q Is there any way of
2 telling from that alignment sheet where those sections
3 are?

4 A I can't.

5 Q Can you, Mr. Williams?

6 WITNESS WILLIAMS: I would
7 suspect that the critical areas may be the R.K.M.
8 unit ^{if} further drilling indicated that there was high
9 ice content.

10 Q And the R.K.M. units
11 or some of them at least that I see, are shown under
12 that lake, is there two bits of it under that lake?
13 That is a lake, isn't it?

14 A I'm sorry, I was looking
15 under the water in the lake. Yes, below the lake,
16 yes sir.

17 Q And is it your guess
18 that those are areas in which, depending on the ground
19 truth, you would be inclined to move to Arctic
20 construction techniques?

21 A That would be my
22 present thinking.

23 Q And that kind of decision
24 making process, as you go to final design, will be
25 keyed by the design manual as well, I take it.

26 A Yes, which would be
27 partly derived from additional field information.

28 Q Yes. Well now, on the
29 right-hand side of that alignment sheet you see a
30 river which I understand is called the Trout River,

Dau, O'Rourke, Williams, Harlan
Cross-Exam by Scott

1 do you see that?

2 A Yes sir.

3 Q Would you expect to use
4 cut grades on the side slopes of the valley there?

5 A Again it would depend on
6 the material in the embankment, Mr. Scott. I couldn't
7 say now.

8 Q I take it that if the
9 material in the embankment was erodable or contained
10 ground ice you might think to do that.

11 A Think to use Arctic
12 construction procedures, yes.

13 Q And that again is some-
14 thing that can only be determined on this alignment
15 sheet, and I presume on all the others, with reference
16 to whatever ground truth you discover and the standards
17 that are established in the design manual.

18 A Yes sir.

19 Q Well now, could you go
20 to the sheet before that, which I think that's called
21 1012, 1M0200-1012, do you have that in front of you?

22 A Yes, we have that,
23 sir.

24 Q Is that an alignment
25 sheet in which you would be inclined to go to con-
26 ventional construction techniques?

27 A ^{would} I certainly suspect
28 that you would go to conventional construction within
29 that area at least in part, and probably a substantial
30 part.

Dau, O'Rourke, Williams, Harlan
Cross-Exam by Scott

1 Q Well, what particularly
2 at the area marked "R.K.M.B.S." which is, I think, just
3 to the left of the two lakes, indeed it's all over the
4 alignment sheet, there are big hunks to the left of
5 the two lakes.

6 A Yes sir.

7 Q Now what is that?

8 A That's the speckled bog,
9 sir.

10 Q Now, what are you going
11 to do when you come there?

12 A Yes, we've given this
13 type of terrain a fair bit of consideration, Mr.
14 Scott. The speckled bog, of course, is intermittent
15 elevated plateaus of high ice content organic material
16 interspersed with thawed areas. It is going to be
17 difficult and, because of the irregularity of the
18 surface in particular the first process will have
19 to be to try to induce some frost into the thawed
20 areas, and they're numerous.

21 Q Let me just ask you one
22 thing. I take it that one of the dominant -- or two
23 of the dominant characteristics of that area are
24 first of all that there are little islands of ice
25 interspersed with little islands of frost-free
26 material.

Dau, O'Rourke, Williams, Harlan
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1 A That's
2 a reasonable description, sir, yes.

3 Q Some of the little islands
4 are raised up above what may be taken to be the
5 surface of the ground.

6 A Yes sir.

7 Q Often as much as eight
8 or ten feet.

9 A I wouldn't put it that
10 strongly, sir. There are cases of palsa mounds
11 that high, but we haven't found that many of them in
12 the area. I would like to suggest more like three to
13 six feet.

14 Q Well, isn't this a case
15 where neither of your techniques would naturally apply?

16 A Because the elevated
17 plateaus that you are speaking of are high ice content
18 organic material, we would recommend that that be
19 graded in that area, sir, in a conventional winter
20 construction manner.

21 Q So that I take it that
22 confronted with that situation you would go to con-
23 ventional construction and do grading.

24 A Yes, it depends somewhat
25 on the magnitude of these elevated plateaus. Some of
26 them, as your drawing indicated earlier in the geo-
27 technical panel, Mr. Scott, showed them fairly small in
28 diameter. There are some that are several hundred
29 feet in diameter where the irregularity of the surface
30 would not present as large a construction problem as

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1 the smaller ones. The grading in the larger ones would
2 -- could conceivably be less severe, less movement
3 of material than in the smaller ones.

4 Q Well, would it be correct
5 to say then that you're going to treat the fens and
6 so on as if they were ordinary muskeg material and
7 compress them?

8 A Yes sir.

9 Q Well now, Dr. Harlan,
10 I'd like to ask some questions about drainage and
11 erosion, and I want to emphasize first of all that
12 in talking about erosion I am not talking about slope
failures as such. Is that understood?

WITNESS HARLAN: That is
undersood, yes.

14 Q I am talking, however,
15 about the overland passage of water and not about
16 rivers.

17 A O.K.

18 Q So we understand what
19 we're talking about.

20 A Yes.

21 Q Well now, I have been
22 shown on the alignment sheets that I think throughout
23 the alignment sheets the right-of-way has been divided
24 into erosion control categories. Is that correct?

25 A That is correct, yes.

26 Q And just so we'll under-
stand what they mean, there are four standard categor-
ies which are numbered EC-1 through EC-4, and they are

Dau, O'Rourke, Williams, Harlan
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1 determined by whether the soil is erodible or non-
2 erodible and whether the slope is less than three
3 degrees and greater than three degrees.

4 A That is correct, yes.

5 Q In addition, I understand
6 that there are four special categories numbered EC-5
7 through EC-8, for special terrain and construction
8 conditions.

9 A That's correct also.

10 Q Now, I take it that
11 these designations which are shown with some precision
12 on the alignment sheets are preliminary and will
13 change when and if more ground truth is ascertained
14 as you move to final design.

15 A Yes, that is correct, yes.

16 Q Well now, when we were
17 talking about slope stability with Dr. Morgenstern,
18 he indicated that in his opinion, you may recall if you
19 were here, that 3% of the slopes -- or he indicated a
20 certain number of slopes that were greater than 3
21 degrees, and directed his attention to them. I take
22 it that erosion problems as opposed to slope problems
23 occur much more widely along the route.

24 A The potential for
25 erosion problems is more widely spread, yes.

26 Q It would be fair to say
27 that there would be relatively few areas where the
28 potential for erosion would not be present. I emphasize
29 "potential", of course.

30 A That would be true, yes.

Dau, O'Rourke, Williams, Harlan
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1 Q Well now, looking ahead
2 to the final mile by mile review of the erosion
3 categories, there are a number of things I want to
4 raise with you. First of all, what is your definition
5 of "erodible" or on the other hand, "non-erodible"
6 soils"?

7 A O.K., the definition
8 as we define this, is dependent on the velocity or
9 erodibility potential. In other words, if run-off
10 is intercepted by the pipeline, for example, it re-
11 quires a certain volume of water and a certain velocity
12 of that water before the soil becomes erodible
13 before it has the transporting capability. O.K.,
14 this is what we are using as a definition of "erodi-
15 bility".

16 Q All right then, when you
17 speak of an erodible soil, what are the criteria by
18 which you will judge it to be ~~non-erodable~~ or erodible

19 A It is the texture of the
20 material, what is the grain size, for example? Is it
21 gravel, is it sand, is it silt?

22 Q Yes.

23 A What is the binding
24 material? We have an organic mat associated with this.
25 Do we have roots established? These are the criteria.

26 Q Are there any other
27 criteria that you have considered in making your
28 definition?

29 A Not that I can think of
30 offhand.

Dau, O'Rourke, Williams, Harlan
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1 Q Is this the definition or
2 the distinction that you've used on the alignment
3 sheets in establishing the categories?

4 A In part, yes.

5 Q Well, is there any other
6 distinction that you've utilized?

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1 A Not that I am aware of.

2 Q Do you have any precise
3 specification for what constitutes erodibility?

4 A Not at this stage,
5 no.

6 Q Do you propose to develop
7 one as you move toward final design?

8 A Yes, we do.

9 Q And will that become
10 a chapter in the design manual to which we are
11 working?

12 A Yes, well, maybe I should
13 elaborate a little further. In terms of erodibility
14 it is a potential for erosion to occur. In developing
15 our designs what we are looking at is looking at the
16 rainfall potential on different areas and what
17 kind of runoff events that you can expect. Associating
18 this with slope and vegetative cover as it affects the
19 run off, then we are routing this through a hydraulic
20 model to determine erodibility.

21 Okay, this is the criteria
22 which we will use in our design manual.

23 Q But have you yet
24 developed a specification that you can provide to us
25 in detail?

26 A No, we have not.

27 Q When do you anticipate
28 that will be done?

29 A It will be the first
30 part of next year. It will be based on this summer's

1 field work.

2 Q Well, now the second
3 thing that I want to ask you is that the cut off at
4 3° I take it is not designed to suggest that there
5 is little concern for erosion on other slopes?

6 A That is correct, yes.

7 Q In fact, slopes at less
8 than 3° may have a considerable potential for erosion
9 depending on the kind of soil that is found in them.

10 A Yes, I would agree with
11 that, yes.

12 Q Would you propose that
13 final design to remove this 3° designation?

14 A The 3° is just an
15 arbitrary value at this point, yes.

16 Q I take it that when you
17 have your specification for soil fully
18 defined and fleshed out you will not have to use
19 this arbitrary figure?

20 A That is correct, yes.

21 Q Well, now, I understand
22 that generally speaking one of the potentials for
23 erosion occurs occurs when the surface of the ground
24 is removed so that the earth underneath it is exposed?

25 A Yes,

26 Q That would be a
27 classic potential erosion situation?

28 A yes, I would agree with
29 that.

30 Q Well, I note then

1 that ~~there~~ appears to be no key-in between your
2 erosion chart on the alignment sheets and whether
3 Arctic or conventional construction will be utilized.

4 A That is correct,

5 Q That will be an important
6 consideration in -- that whether conventional procedures
7 are used in construction will be an important consideration,
8 will it not, in determining the erosion potential
9 of that particular area?

10 A Yes, the designs as
11 we propose them are for bare soil conditions, so it
12 is not as major a consideration as it might first
13 appear. We are designing for the worst situation,
14 not the best.

15 Q Is that true throughout,
16 all the way to Richard's Island?

17 A Yes, it is.

18 Q Well, now, when it has
19 become established by the design manual or by final
20 design which areas will be built by conventional
21 construction techniques I take it that you will be
22 able to become much more precise about the potential
23 for erosion there and elsewhere?

24 A Yes, that is true,
25 yes.

26 Q Now, I also gather from
27 looking at the alignment sheets that -- and the
28 reports, the sheets on a mile by mile basis and
29 your reports that erosion is mainly a concern in
30 sensitive permafrost areas and I take it that that would

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1 not really be true, would it?

2 A Well, there is a greater
3 potential in sensitive permafrost areas in that the
4 thermal erosion is a problem as well as mechanical
5 erosion.

6 Q But I take it that erosion,
7 that the potential for erosion can exist in both
8 permafrost and non-permafrost areas?

9 A Very definitely.

10 Q And I take it that
11 when you move to a more precise erosion designation on
12 the alignment sheets, you will reflect your knowledge
13 then about whether the area is permafrost or non-
14 permafrost?

15 A Yes, we will.

16 Q So that would it be
17 fair to say that your analysis of erosion potential
18 is going to depend to a very marked extent on the
19 groundwork that is done perhaps for others to determine
20 whether conventional techniques are going to be used
21 to determine whether it is permafrost or not and
22 to determine other matters of that type?

23 A Yes.

24 Q And only after all that
25 has been done will you be able to devise an accurate
26 erosion map of the route -- erosion potential map
27 of the route.

28 A Yes, Okay, if we are
29 evaluating terrain types as to the erodibility also
30 included in that terrain typing would be whether it is

1 frozen or non-frozen. We are also looking at the
2 slopes, , the length of slopes and the position of the
3 pipeline relative to the slopes, so all of these
4 in combination allow us to evaluate the erodibility
5 of material .

6 Q Now, you prepared
7 or supervised the preparation for Northern Engineering
8 Services Company Limited a report called, "Drainage
9 and Erosion Control Measures."

10 A Yes, that is correct.

11 Q That has not been
12 made an exhibit, Mr. Commissioner, and I think that
13 it should be. There is a copy on your desk and perhaps
14 in due course that can be given to Miss Hutchinson and
15 she can mark it as exhibit number 121

16 MR. MARSHALL: Perhaps
17 we ought to mark Dr. Harlan's qualifications too,
18 if that has not already been done.

19 MS. HUTCHINSON: : 120.

20 (DR. HARLAN'S QUALIFICATIONS MARKED AS EXHIBIT 120)
21 (REPORT ENTITLED "DRAINAGE AND EROSION CONTROL
22 MEASURES" MARKED AS EXHIBIT 121)

23 MR. SCOTT: Well, now, Dr. Harlan,
24 I take it that you would not hesitate to agree with
25 me that backfill over the pipe is one of the most
26 important things to be considered in dealing with
27 the problems of drainage and erosion control?

28 A I would agree with
29 you.

30 Q I note, for example, that

1 | notwithstanding its importance, if you look at
2 | figure 3, Drainage and Erosion Control Measures, which
3 | is a chart of various berms and measures, do you
4 | have that in front of you?

5 | A Yes, I do.
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1 MR. SCOTT: These sheets that have
2 six diagrams on it.

3 THE COMMISSIONER: Yes, I have it.

4 Q I note that notwithstanding
5 the importance of the choice of select or native
6 backfill that these diagrams are perhaps typical of
7 the book, say "select or native backfill", that is to
8 say they don't appear to make a choice
9 with relation to the design. Would that be fair?

10 A That is fair, yes.

11 Q Well now, --

12 THE COMMISSIONER: Excuse me,
13 Mr. Scott. I don't understand that. What's the point
14 that you've made and Dr. Harlan has agreed to?

15 MR. SCOTT: Perhaps I haven't
16 properly come to it, and let me put this question,
17 Mr. Commissioner, and see if it helps.

18 Q I take it that when you
19 backfill the trench, there is, if native backfill is
20 used, a risk that the trench will subside.

21 A Yes.

22 Q And that means that it
23 becomes lower than it was when it was built, and lower
24 than the adjoining surface.

25 A Well, I agree that it
26 would be lower than when it was originally filled, but
27 it may not be lower than the original surface.

28 Q All right.

29 THE COMMISSIONER: Well, it
30 doesn't fill up because of the thawing. Is that the

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1 reason?

2 A No. When it's packed
3 in it's hard to get a good packing if it's frozen.

4 MR. SCOTT: Q It settles,
5 doesn't it?

6 A There's a large void
7 space in the material so as it thaws it will settle.

8 Q It's the function of
9 settling more than anything else though, isn't it?

10 A Yes.

11 Q Yes, just as if you
12 fill any hole with the earth that -- or with a portion
13 of the earth that came out of it, if you fill to a
14 certain level after a winter season, it may be found
15 to ~~have~~ settled an inch or two or even more.

16 A That's correct, yes.

17 Q And I take it that in
18 the course of settling the results may be that the
19 settled area is lower than the adjacent areas which
20 have not been dug.

21 A O.K., if only a portion
22 of the backfill is replaced, yes.

23 Q All right, but there is
24 a risk of this kind of settling when native backfill
25 is used.

26 A I suppose there is, it's
27 a very small risk, though.

28 Q But I put it to you
29 that the danger inherent in that is that the drainage
30 devices which are designed and are in place may then

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1 cease to work effectively if there has been that kind
2 of subsidance.

3 A If there is that amount
4 of subsidance, yes.

5 Q So that the selection
6 between native backfill and select backfill is crucial
7 to assure -- or may be crucial from case to case -- to
8 ensure that the drainage devices that are in place
9 actually work.

10 A Yes, I would agree with
11 that.

12 Q In other words, if you
13 develop the most perfect drainage devices known to
14 man and put them in place, if there is subsidance over
15 the trench some or many of them may not in fact
16 function.

17 A Yes, that is true.

18 Q Is the point -- and you
19 would be aware, I take it, of many pipeline cases
20 built in non-permafrost muskeg areas using winter
21 construction where subsidance has occurred, even
22 though the spoil over the pipe had been mounded.

23 A I have seen pictures of
24 them; I am not personally familiar with them.

25 Q Well, you would agree
26 with me that that would raise in classic form the
27 kinds of problems to which I'm trying to direct
28 ourselves.

29 A Yes, I would agree.

30 Q And you would agree that

1 if that occurs in muskeg areas, the risk for it is
2 just as great if not greater in permafrost areas.

3 A In ice-rich permafrost
4 material.

5 Q In ice-rich permafrost
6 areas, and so I put it to you that if appropriate
7 backfill is not utilized, even on gentle slopes there
8 is a risk that the drainage devices in place may not
9 function effectively.

10 A I would agree with you
11 to the point that the depression over the pipe may
12 act as a way of diverting flow.

13 Q Yes, and of course if
14 the depression over the pipe acts as a way of divert-
15 ing flow, you not only aren't using the drainage
16 devices but you run the risk that the pipe route
17 itself may erode as the water goes down.

18 A In that sense, yes.

19 Q Well now, what I'm
20 concerned about is this, that nowhere have I been
21 able to find in concrete terms any description of
22 where native backfill will be used and where select
23 backfill will be used, notwithstanding the importance
24 of the choice. Are you able to help me by giving
25 me any precise criteria?

26 A The precise criteria
27 to my knowledge are not available or not written down
28 in any form. But these criteria would involve the
29 potential force of settlement of the backfill materials
30 which would include ice content.

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1 Q Well, one of the things
2 that concerns me is this is a relatively significant
3 matter, when may we anticipate knowing in what circum-
4 stances, with some degree of precision, native as
5 opposed to select backfill will be used, or the other
6 way around?

7 A This has been incorpora-
8 ted in our design manual and design criteria.

9 Q Does that give us any
10 hints as to the characteristics that are going to
11 govern, the keys that are going to be at stake?

12 A Well, this is the
13 potential for thaw settlement which would include
14 the amount of ice in the material, some idea of the
15 organic content, the size of the backfill material
16 as it's being placed in.

17 Q Dr. Harlan, let me
18 refer you to two parts of the material. In the
19 application to the Department, and I can give you
20 the reference and I'll read it. The reference is
21 8.B.1.3.8.4, the authors of the application -- were
22 you one of them, by the way, did you write this?

23 A No sir, I wasn't.

24 Q All right, say this:
25 "Where the pipeline descends or ascends a slope
26 steeper than about three degrees in ice-rich
27 permafrost areas, and conditions are such that
28 backfill settlement on thawing could lead to
29 erosion or instability, selected stable back-
30 fill will be used. Where possible in ice-rich

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1 permafrost areas the use of deep drainage
2 will be avoided and ponding of water will
3 be prevented."

4 Now, tell me if I'm correct. I understand that to
5 be an assertion that where slopes are greater than three
6 degrees and there is ice-rich permafrost, selected
7 backfill will be used.

8 A Yes, that's what it
9 states sir.

10 Q Well now, the difficulty
11 I have is that further on -- well, it's not in the
12 application, it's in the responses to the Pipeline
13 Application Assessment Group at pages 21-5 and 21-6
14 the answer says:

15 "By and large it is evident that for steep
16 slopes in exceedingly ice-rich soils in
17 which preventive stabilization techniques
18 are required in order to ensure the stability
19 of the right-of-way, measures will also be
20 required to ensure the stability of the
21 ditch backfill. In certain situations it
22 may be found necessary to backfill the entire
23 ditch with select material."

24 Now, it seems to me that that isn't quite as generous
25 a statement as the one contained in the application.
26 Would you agree?

27 MR. MARSHALL: Mr. Scott, could
28 you tell me the page of that first reference, 8.B.1.3.8.
29 4?

30 MR. SCOTT: I'm sorry, I

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1 don't have the page number.

2 MR. MARSHALL: I think it's
3 page 6. I'd just like to give the witness a copy.

4 MR. SCOTT: 63.

5 A The one in the PAAG
6 report, that was on page 21-5?

7 Q Yes. The application
8 seems to suggest backfill for more locations than the
9 PAAG answer does.

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1 A I think it all depends
2 on the nature of the backfill material.

3 Q Well then, let's see if
4 I can understand what your position is. You in due
5 course, I take it, will be making a recommendation to
6 the Northern Engineering Services with respect to
7 backfill criteria.

8 A Yes, that is correct.

9 Q That's your part of the
10 design manual.

11 A Yes.

12 Q Would it be correct to
13 say that -- or is your recommendation likely to be
14 that select backfill should be used in erosion-sensitive
15 soils, regardless of the slope?

16 A No, it wouldn't.

17 Q Why not?

18 A In terms of level, where
19 there is no slope, I don't think there will be much
20 of a requirement for the use of selective backfill.

21 Q Let me put it to you this
22 way, we'll leave out absolutely level slopes. Are you
23 prepared to recommend to the -- for the design manual,
24 that select backfill should occur where there are
25 erosion-sensitive soils and at any degree of slope?

26 A I think it depends upon
27 the position or the site-specific situation. If it's
28 a very short slope, even though you may have highly
29 erodible soil, potential for erosion would be small.
30 Where on long slopes you would have a much higher

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1 erosion.

2 Q Well --

3 A It depends on the condi-
4 tion of the situation, not just the soil.

5 Q -- do I understand from
6 that that you are not going to recommend select back-
7 fill in every place where there are erodible soils?

8 A That is correct.

9 Q All right, now in what
10 cases with as much precision as you can give me, are
11 you going to say, "even though these are erodible
12 soils, you don't have to use select backfill."

13 A It's where you do not
14 have a potential for erosion.

15 Q No, but we've talked
16 about potential for erosion as being the existence of
17 erodible soils. Lets start there for the moment.

18 A I would like to make a
19 distinction between erodible soil and a potentially
20 erodible situation.

21 Q All right, what are the
22 characteristics of that situation that would lead you
23 to say, "This is a case where you must use select
24 backfill." What are the criteria?

25 MR. MARSHALL: I think we're
26 piling up three or four things, Mr. Scott. I don't
27 think Dr. Harlan's really been given a chance to give
28 his answer and expand on it.

29 MR. SCOTT: I'm sorry.

30 MR. MARSHALL: Where do you

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1 want to start?

2 MR. SCOTT: Well --

3 A Mr. Williams pointed out one
4 thing,
5 we do have the option for maintenance. If settlement
6 is greater than anticipated, then we can come back
7 in the following winter and correct the situation.

8 Q Well, I understand you
9 have the option for maintenance and I'll be coming to
10 that in a moment. I am really asking now, where you
11 are going to recommend select backfill, and I take it
12 that the first characteristic of the select backfill
13 situation is going to be erodible soils.

14 A Yes.

15 Q All right. Now we have
16 erodible soils. What else must there be in your
17 judgment before you will recommend select backfill?

18 A There has to be the
19 potential for accumulation of sufficient run-off or
20 sufficient water to cause potentially erosive
21 situations.

22 Q Well, all right.

23 A So this depends on the
24 steepness of the slope, the length of the slope, the
25 drainage area involved.

26 Q All right, what are the
27 criteria that you are going to select with respect
28 to length, height and drainage?

29 A The specific criteria
30 hasn't been established.

Q Yes, for the design

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1 manual, they have not been established?

2 A They have not been
3 established.

4 Q Have you any guidelines
5 as to what you will select as your criteria?

6 A The erodibility will
7 probably be selected in terms of velocity criteria,
8 a maximum allowable velocity.

9 Q What is the maximum
10 allowable velocity that you presently contemplate as.
11 recommending?

12 A This depends on the
13 material and the vegetative cover.

14 Q Well, it's circular,
15 in other words. What kind of vegetative cover are
16 you going to --

17 A This varies with grasses,
18 MR.MARSHALL
19 it varies with moss, / I think somebody else has
20 determined that.

21 MR.SCOTT: Beg your pardon?

22 MR.MARSHALL: I think somebody else
23 has determined that already.

24 MR.SCOTT: Determined what?

25 MR.MARSHALL: The vegetative cover.

26 THE COMMISSIONER: A higher
27 authority, that's what he means.

28 MR. SCOTT: Well, are you
29 able to help us at all as to the keys that you will
30 utilize in determining where we may expect select
backfill? You, as I understand you, what you've said

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Cross-Exam by Scott

1 is, "Well, I'll look at the situation and judge."

2 But obviously you're going to have to have some
3 formula, aren't you?

4 A That's correct, yes.

5 Q All right, have you any
6 hint at the moment that you can give us as to what
7 those formulae are going to be?

8 A O.K. Maybe it's a
9 roundabout way of answering the question. What we're
10 presently evaluating now is the potential, the rainfall
11 intensity frequency/^{duration}curve for different portions of
12 the route. O.K., the evaluation of this gives us some
13 indication of the type of rainfall events that you
14 can expect over the life of the pipeline.

15 O.K., from this we are
16 routing this to a kinematic type of wave equation
17 to generate runoff events. O.K., so we're translating
18 rainfall into potential runoff.

19 Q Yes, and that gives you
20 volume of water.

21 A It gives you volume of
22 water; it also gives you a flood frequency curve
23 that you can apply to different segments of the
24 right-of-way.

25 Q Yes.

26 A O.K., this in turn
27 is being routed through what you would call a
28 hydraulic model. It evaluates the potential erodibility
29 of different materials. If you have a segment of the
30 pipeline route, for example, on a hillside, water that

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1 comes down from the hillside is intercepted by the
2 mound over the pipeline O.K., it is diverted by the
3 mound. O.K., our criteria then, depending on what
4 material you have used to make your backfill mound,
5 if you've lined it with gravel or it's silt material,
6 sand material, these have different erosion potentials,
7 or erodibility indexes, if you will. O.K., this is
8 the procedure which we're using to develop guidelines
9 or criteria for the placement of our erosion control
10 measures.
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Q Is that the analysis

in substance that appears in your report?

A Yes, it is . Okay,

we are in the process of refining that analysis at this time.

Q Well, that leads us

to another thing that you have done in your reports

as I understand it, which is a kind of a cost benefit

analysis under which you have determined

the extent to which erosion techniques will be applied,

is that correct?

A That is correct, yes.

Q Now --

A That is a very prelim-

inary estimate.

Q Well, it does not

look very preliminary to me, it is full of equations,

but I take it that what you have done, you have

attempted to determine respective costs in the

first place?

A That is correct, yes.

Q Now, what are those

respective costs in simple form?

What is the equation to

which you have directed yourself?

A The costs incorporate

two main things. ONE, the cost of different designs

as you can relate to different design floods.

Q Yes ?

A Okay, as the size of

1 your design flood increases the cost of initial construction
2 goes up, obviously.

3 The second main cost area is
4 the cost of maintenance. For example, if you under
5 design your erosion control measures, the cost of
6 maintenance is extremely high. If you over design
7 way on the conservative side, then your costs of
8 maintenance are very small.

9 Q And I take it that what
10 you have tried to formulate for your company in
11 that exercise is the amount of erosion devices techniques
12 and controls that will produce a minimum annual maintenance
13 cost. Or an acceptable annual maintenance cost?

14 A We are trying to optimize
15 the total costs, not just on an annual basis.

16 Q Yes, but I take it that
17 you have elected not to prevent erosion, which would
18 be very expensive and not to leave everything to
19 maintenance. You are looking for a way inbetween.

20 A To prevent all erosion --

21 Q --would be expensive.

22 A --very, highly expensive.

23 Q Yes. To prevent none
24 would also be expensive.

25 A That is correct.

26 Q All right. Now, what
27 you are trying to do is find a middle way in which
28 the maintenance costs are at an acceptable level.

29 A That is correct. Yes.

30 Q And that is what your

Dau, O'Rourke, Williams, Harlan
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1 formula attempts to do?

2 A This is right, yes.

3 Q And I take it that implicit

4 in that formula is that erosion will in fact occur?

5 A A very minor degree

6 of erosion.

7 Q A degree of erosion that

8 you can correct by acceptable annual maintenance

9 costs?

10 A Yes.

11 Q And I take it that

12 --

13 A May I add one other point

14 here.

15 Q Yes.

16 A Okay, the designs as
17 we have proposed them are for bare soil conditions.

18 Q Yes.

19 A Okay, coupled with
20 this design is a revegetation program. So, which
21 means that with in a period of two or three years
22 we have added protection of the right-of-way
23 or the exposed soil conditions, so we are minimizing
24 erosion in that sense as well.

25 Q Well, you are two
26 steps ahead of me, but I take it first of all you
27 have directed yourself to the acceptable annual
28 maintenance costs?

29 A Yes.

30 Q And that assumes that

1 there will be at least until vegetation takes over,
2 erosion -- of some type?

3 A A very limited degree
4 of erosion.

5 Q And I take it that
6 one of the consequences of erosion in large or
7 small amounts is the delivery of sediment to rivers
8 and lakes and wherever it may flow?

9 A Yes.

10 Q And you are conscious
11 of the fact, no doubt, that that is something that
12 upsets fish biologists?

13 A Yes, I am aware of
14 that.

15 Q And I take it that
16 in your equation, and I do not criticize it, but in
17 your equation, you have no factor for the environmental
18 losses or damage that may occur as a result of the
19 minimal acceptable erosion.

20 A I think in this context
21 we have to consider the situation in which it is
22 applied. Whereas we may allow a very minimal
23 amount of erosion on the right-of-way, we are
24 very much concerned about the off right-of-way
25 effects as well.

26 Q But I take it, Dr. Harlan,
27 that if you were to prepare a cost benefit equation,
28 you would put into that equation the costs, the
29 environmental costs, attached to the erosion that
30 does occur.

1 A If you knew how to
2 evaluate them.

3 Q All right, but you
4 do not know how to evaluate them.

5 A No.

6 Q And as a consequence
7 that element of cost is not contained and perhaps
8 cannot be contained in your equation.

9 A That is correct, yes.

10 Q All right. So that
11 there is an element of cost that is outside the
12 equation.

13 A Yes.

14 Q I take it also as
15 you have just said that the equation is based on
16 the period of time before which vegetation will
17 in your judgment remove the erosion or vastly
18 modify the erosion problem.

19 A That is correct,
20 yes.

21 Q And that operates on
22 the assumption that vegetation will in fact do
23 what you have assumed, that is, remove the erosion
24 problem?

25 A Yes.

26 Q And what we are
27 really talking about is revegetation.

28 A Revegetation. Yes.

29 Q Do you know where,
30 do you know of any place where revegetation has been

Dau, O'Rourke, Williams, Harlan
Cross-Exam by Scott

1 tested in a slope situation? In terms of its
2 potential in terminating erosion?

3 A There are numerous
4 examples.

5 Q Well, have you done
6 any such tests?

7 A I personally have
8 not been involved in any, no.

9 Q And I take it that
10 ARctic Gas -- or that its experts have not done
11 any?

12 A I do not think that is
13 correct.

14 Q Well, I understand that
15 the SanS Sault is all pretty flat , is it not?

16 MR. MARSHALL: We will be
17 calling witnesses who have been involved in the
18 revegetation programs, Mr. Scott, and I think that
19 is probably the best source of information for you.

20 MR. SCOTT: All right.

21 Q I take it that
22 you would not look to Pointed Mountain Pipeline
23 as a very helpful example of what revegetation
24 can do?

25 A I think that there
26 are some very excellent examples of stabilization of
27 the right-of-way due to revegetation .

28 Q And some classic failures?

29 A Yes.

30 Q Well, now, let me come

1 to one of the particular techniques and I do not know
2 whether Mr. Williams should answer these questions
3 or you should, but in your report in section 3.1.5,
4 you indicate that you intend to make extensive use
5 of windrows which are cleared debris, posts and brush
6 and that sort of thing, as dispersion barriers.

7 A Yes, I do not think
8 that we make mention of extensive use.

9 Q Well, you intend to
10 use them alot, don't you?

11 A I am not sure how
12 much we will be using them, but we will be using,
13 them, yes.

14 Q You will know better
15 when you have the design manual?

16 A I am not sure at what
17 point.

18 Q But the purpose of
19 using them is as an erosion protection measure?

20 A It is as a means of
21 dispersing flow, yes.

22 Q But that is to prevent
23 or reduce erosion?

24 A Yes.

25 Q Howlong in your judgment
26 will these windrows remain effective?

27 A In my judgment they
28 would be effective for a sufficient length or a
29 sufficient time until the right-of-way is completely
30 stabilized.

DAu, O'Rourke, Williams, Harlan
Cross-Exam by Scott

1 Q Until revegetation?

2 A Until revegetation.

3 Q All right, how many
4 years do you think the windrows are going to be
5 effective?

6 A I would suggest for ten
7 to fifteen years.

8 Q Ten to fifteen years.
9 What are you going to do in the event of rotting
10 or destruction of them in that fashion, are you
11 they going to be replaced?

12 A No, sir, but revegetation
13 would be established by that time.

14 Q Well, let me ask you
15 this, when do you count on revegetation being established
16 so that these devices will not be necessary?

17 A Again, this is a
18 question that probably should be addressed to our
19 vegetation people, but it is my understanding that it
20 will be three to five years. --

21 Q Yes,

22 A -- before vegetation is
23 effective for protection against erosion.

24 Q All right, well, do I
25 understand then that the theory under which you
26 have been operating is that if you develop erosion
27 protection measures that are valid, that are useful
28 for five years, you have done your job 100%?

29 A I think that the measures
30 that we have designed will provide added protection

1 beyond the five year period.

2 Q But is it not built into
3 your design the assumption that you will not need
4 them after five years?

5 A In some situations,
6 yes.

7 Q In the case of
8 windrows?

9 A Yes.

10 Q Is there any fire or
11 tree disease hazard associated with these?

12 A There may be, yes.

13 Q What is going to be
14 done about that, or do you know?

15 A I do not know.

16 Q Have you given any
17 thought to it?

18 A We have provided for
19 fire breaks with the windrows.

20 Q I see. What are you
21 going to do north of the treeline?

22 A We obviously will not
23 use windrows.

24 Q No, but what are you
25 going to use in order to disperse the water.

26 A Well, in view of the
27 Arctic construction techniques, this will not be
28 necessary,

29 Q So you do not think that an
30 erosion control device will be necessary north of the

DAu, Williams, O'Rourke, Harlan
Cross-Exam by Mr. Scott

1 treeline?

2 A No, windrows will not
3 be necessary north of the treeline.

4 Q Have you erosion control
5 devices that will be utilized north of the treeline?

6 A Yes.

7 Q Would you just list them
8 and tell me what they are by name.

9 A We will provide if
10 necessary granular protection of the mound. So
11 this would be just a granular cap, we are providing
12 mound breaks, ^{which} will be just a break in the mound --

13 Q Yes.

14 A -- and gravel protected.
15 We will provide ditch plugs which will prevent
16 lateral flow along the pipeline.

17 Q Yes.

18 A We may use rip-rap, in
19 terms of rocks placed to disperse flow, reduce the
20 erodibility. We would possibly use diversion dikes
21 which would be to divert and direct the flow. I
22 believe these are the main ones.

23 Q Well, let me ask you about
24 one particular situation in which windrows may be
25 utilized. In ice rich permafrost areas do you agree
26 with our advisors that there is a possibility of
27 ground ice melting beneath the windrow and creating
28 channels through which a concentrated flow of
29 water may pass?

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Cross-Exam by Scott

1 A I haven't considered this
2 in depth. It would be my impression that the windrow
3 would provide insulation.

4 Q So you're --

5 A And would not accelerate
6 permafrost degradation.

7 Q So your answer to that,
8 if I understand it, is that ground ice wedge isn't
9 going to melt.

10 A Yes.

11 Q Are you familiar with --

12 THE COMMISSIONER: Excuse me.
13 I think we should break for coffee now.

14 (PROCEEDINGS ADJOURNED FOR FEW MINUTES)

15 (PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)

16 MR. SCOTT: Q Dr. Harlan or
17 Mr. Williams, in the application there is described the
18 use as an erosion control measure of diversion dikes,
19 and I understand that they're designed to intercept and
20 direct the runoff across the right-of-way; is that
21 correct?

22 A That is correct, yes.

23 Q And they're illustrated,
24 I think, in some highly idealized sketches in Dr.
25 Harlan's book, is that correct?

26 A That is correct, yes.

27 Q It appears to me in
28 looking at those that the dikes in fact run beyond the
29 right-of-way; is that correct?

30 A That is correct.

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Cross-Exam by Scott

1 Q And I take it that
2 that occurs in both kinds of construction,
3 doesn't it?

4 A If these are carried
5 off the right-of-way, yes.

6 Q Well, what I want to
7 know is how are they going to be built off the right-
8 of-way?

9 A In convention pipeline
10 construction the usual procedure is to mound this
11 material up with dozer tractors. In this case some
12 of that would be pushed off to the side, and I presume
13 there would be a minor amount of hand work required
14 to extend those a few feet off the right-of-way.

15 In Arctic construction
16 procedures, this will have to be done, of course, with
17 borrow material and we see that placed with trucks
18 hauling in the borrow material -- I should say that
19 this will be the last thing that is done on the right-
20 of-way after the construction and most of the activity
21 has moved off, it's the last thing that is done
22 because it interferes with traffic down the right-of-
23 way.

24 Q Well--I'm sorry, go
25 ahead.

26 A So it will be placed
27 by truck with a minor amount of equipment to shape it
28 into the appropriate shape, and again a bit
29 of hand work off to the side of the right-of-way.

30 On the working area where there will be a thin

Dau, O'Rourke, Williams, Harlan
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1 snow cover, we would see placing these diversion
2 dikes on top of the snow. If the snow road itself
3 has a substantial thickness, we would see that a small
4 excavating piece of equipment would have to be
5 utilized to cut a trench carefully through the snow
6 road and install the granular material, or the material
7 that the diversion dike is to be constructed from in
8 the trench in the snow road.

9 Q Well, I take it what
10 we must conclude then is that when it is necessary .
11 to construct these, equipment will have to be taken
12 off the right-of-way, in cases in which to do it.

13 A Not necessarily. It
14 could be placed with a small backhoe whose wheels were
15 on the right-of-way and the bucket was off the right-
16 of-way.

17 Q All right, is that the
18 way you're going to do it, Mr. Williams?

19 A Oh, we haven't really
20 thought about it that seriously. It could be that
21 or either a combination of that and hand work. There
22 will be maintenance and operations people on staff
23 during this period, and we would see that they would
24 take a leading role in this activity because they
25 will also be maintaining those systems in the months
26 to follow construction.

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Cross-Exam by Scott

1 Q Now the question in the context of
2 the whole work may be thought to be facetious but
3 it's not. I take it that in order to do this work it's
4 going to be necessary to take equipment from time to
5 time off the right-of-way. Is there any doubt about
6 that?

7 A To a minor extent, yes
8 sir.

9 Q And it also follows that
10 in certain areas it's going to be necessary to clear
11 trees and bush and so on off the right-of-way in order
12 to make a place for these things.

13 A Yes sir.

14 Q Yes. Is there any way of
15 knowing before the design manual is produced how
16 many of these there are likely to be?

17 WITNESS HARLAN: I would say
18 no. I think it's fair to add that not all dikes will
19 extend off the right-of-way.

20 Q Is there any ball park
21 figure you can give us as to how many dikes per mile
22 will be required?

23 A It would be a complete
24 guess.

25 Q Well now, I would like
26 to deal with right-of-way cuts. You've shown on some
27 of the diagrams, I think, situations in which the
28 right-of-way at a creek or a valley or approaching
29 a creek or a valley from the top has been cut down to
30 the valley floor, and I take it that that would be

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Cross-Exam by Scott

1 a typical configuration?

2 A I'm not sure what you
3 mean by "typical".

4 You're referring to
5 figure 4?

6 Q I'm looking at the last
7 fold-out which is figure 4. Do you have that in front
8 of you?

9 A Yes, I do.

10 Q Well, that shows a cut,
11 does it not --

12 A Yes, it does.

13 Q -- in which a hillside
14 is cut away?

15 A That's correct, yes.

16 Q And I take it that that
17 is a reasonably typical configuration that will appear
18 at many locations on the route?

19 A I don't know how many
20 but it is a configuration that we may use, yes.

21 Q It's a configuration that
22 you will have to use from time to time.

23 A I would think so, yes.

24 Q And principally, of
25 course, at rivers perhaps, or steep slopes?

26 A That's correct.

27 Q Now, I'm not quite
28 clear from the diagram, is it the intention, once
29 having done that, to fill the cut right up again to
30 the top to the original ground surface level?

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Cross-Exam by Scott

1 A I think ~~that~~ approaches
2 the original ground surface, yes.

3 Q But I take it that a
4 portion of the cut will remain after the work is
5 completed?

6 A I'm not sure.

7 Q Well, can Mr. Williams
8 help me there?

9 A The cross-section which
10 is shown in the bottom right-hand corner does indicate
11 that a slight dish-shaped depression does remain.

12 Q Well, can we have an
13 expression of general intention from the designers?
14 Are you intending to fill it up or are you not?

15 A Yes, we are intending
16 to fill it up. This would be my feeling anyway.

17 Q Do you disagree, Mr.
18 Williams?

19 WITNESS WILLIAMS: Oh, again
20 it would be a site specific thing but I would say
21 generally in the area that we're talking about, yes,
22 it should be filled up.

23 Q I take it it should be
24 filled up because if it's not it creates a special
25 kind of drainage problem?

26 WITNESS HARLAN: That is
27 correct, yes.

28 Q IN which the water is
29 channelled into the cut and runs off down to the
30 bottom.

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Cross-Exam by Scott

1 A Right.

2 Q But is it understood
3 that because of the intention to fill up this parti-
4 cular problem is not likely to occur?

5 A In most situations if
6 there is a potential for thaw settlement, for example,
7 this would create this dish-shaped configuration. Then
8 I think we would go to the use of select backfill, or
9 different materials in order to prevent this from
10 happening. But combined with this we would also
11 have to provide additional erosion control measures.

12 Q But I take it then
13 whatever measure you utilize, it is not anticipated
14 that following construction there will be any cuts
15 or portions of cuts left through which water may
16 channel?

17 A I think that is
18 correct, yes.

19 Q I take it, for example,
20 that's why you haven't designed any silt basins at
21 the foot of them or anything of that type, because
22 they won't be there when the work is done?

23 A Well, we haven't shown
24 them.

25 Q Well, do I understand
26 it that you're not going to need them because these
27 cuts will not exist when the repair work is done?

28 A During the process of
29 re-vegetation it may be necessary to provide some
30 measure to control siltation.

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1 Or a siltation pond, I don't think we've ruled this
2 out.

3 Q Have you any plans at
4 all for a siltation pond? We have been unable
5 to find anything that deals with it.

6 A I can't think of any
7 place we've listed them. That's not to suggest that
8 we have ruled them out, no. I think there are some
9 associated with some of the river crossing information.

10 Q Well, do you anticipate
11 that you're going to need them?

12
13 I don't want you to design some-
14 thing you won't need, but are you going to need silt ponds
15 or sediment basins or whatever they're called?

16 A I suppose there are
17 situations where we will need them. I think these
18 will be very limited in occurrence.

19 Q Yes, and I take it that
20 they are necessary in certain circumstances to prevent
21 the sediment from being carried into rivers and lakes?

22 A They may be, yes.

23 Q Well, are you able to
24 tell us anything about the circumstances in which you
25 may need them, how you will build them, where you
26 will put them, how the water will be controlled into
27 them, how the water will be -- if it is -- controlled
28 out of them?

29 A I must admit I haven't
30 given much consideration to it.

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Cross-Exam by Scott

1 Q I forgot to ask you one
2 thing, Dr. Harlan. Are you familiar with an article
3 called:

4 "Catline Rehabilitation & Restoration,"
5 which is a report by Bolstad in a paper or magazine
6 called, "Alaska of 1971," at page 108?

7 A No, I'm not.

8 Q A cat line, you under-
9 stand to be equivalent to your windrows?

10 A I wouldn't have inter-
11 preted it that way, no.

12 Q What do you understand
13 a cat line to be?

14 A I'm not sure.
15 Mr. Commissioner,
Q I suppose if the

16 witness isn't familiar with the article I can't
17 introduce it through him, but I will attempt to do
18 so later. Well now, Mr. Dau, just a few brief ques-
19 tions on scheduling. Could you briefly outline the
20 questions or the problems that would result in the
21 event that, for the purposes of scheduling, the owner
22 under-estimated the pipeline mileage per spread?
23 What's going to happen if an under-estimate has been
24 made?

25 WITNESS DAU: You're referring
26 to the amount of work the contractor can do in the
27 season, or the amount of pipe?

28 Either one.
29 Q / What are the costs, in
30 what neighborhood are the costs, or what's at risk if
you under-estimate?

A I want to make sure I understand your question, Mr. Scott. You're talking about contractors' progress, whether he in fact could do that quantity of work in the winter season, is that the question?

O Yes, you've estimated.

A Yes, it would --

if in the first winter construction season it became apparent that the contractors could not complete the quantity of work that it had been estimated, --

A Yes.

A Yes.

A All right.

Q Now what are the consequences for the owner of that kind of mistake?

1 A The consequences would
2 be that he would require additional work forces in
3 the second winter, obviously to catch up the
4 spreads that were utilized in the second winter
5 would have to be larger and the very worst possible
6 circumstance may be more spreads.

7 Q No, I do not think that
8 I have made myself clear.

9 A I am sorry, sir.

10 Q You -- presumably
11 you and your people had an internal debate as to
12 whether there ~~should~~ be eight spreads, nine spreads
13 or ten spreads --

14 A That is true.

15 Q Yes, and you would
16 want to select the number of spreads that could do
17 the job because that is the first requirement and
18 do it most economically in terms of ^{the}resources of
19 the owner.

20 A Yes.

21 Q And with due regard
22 for the environmental requirements and so on.

23 A Yes.

24 Q And you have selected
25 nine as the optimum number of spreads which will do
26 the job?

27 A Yes.

28 Q Now, that is your
29 estimate. Now, what I am saying to you is what
30 are the economic consequences and perhaps it is

Dau, Williams, O'Rourke, Harlan
Cross-Exam by Scott

1 an obvious question, if you had picked ten spreads
2 and had therefore underestimated the amount of work
3 that a manned spread could do?

4 A It would cost slightly
5 more.

6 Q I take it that it would
7 cost the cost of a spread over two years.

8 A Yes, that is right.

9 Q And as a very rough
10 ballpark figure, what would you give for that?
11 20 million dollars?

12 A Probably more than
13 that.

14 Q In the range of 30, let
15 us say, 25, 30?

16 A The cost of the
17 equipment for a spread is on the order of 20 to 25
18 million dollars and this is the new purchase price
19 for all of the equipment.

20 Q Yes. Well then,
21 would 30 or 35 be fairer?

22 MR. MARSHALL: I am sorry,
23 Mr. Scott, it is maybe me or the hour or the
24 temperature in the room, but if he has underestimated
25 and got ten spreads--?

26 MR. SCOTT : If he has
27 picked ten spreads and therefore underestimated the
28 amount of work his men and equipment can do. That is,
29 if he has got one more spread than is necessary, what
30 are the costs of that for the company?

1 MR. MARSHALL: So the
2 productivity per spread is higher than the estimate
3 had been, I see.

4 MR. SCOTT: Apart from
5 that cost, Mr. Dau, are there any other costs to
6 the owner, of that kind of error?

7 A Yes, it would involve
8 the costs associated with the movement of the equipment
9 around, the costs associated with the movement of
10 people around and so forth.

11 Q All necessary because
12 you have put on in this example one extra and by
13 definition unnecessary spread?

14 A Yes, also assuming that
15 the amount of labour hours per foot of pipeline
16 would not change, because you would just build it up
17 a little faster, is what you are saying.

18 Q Yes, well, now let's
19 take the converse proposition, a situation in which
20 as I would use the terminology, you have overestimated
21 for the purpose of scheduling, the work that a
22 spread can do.

23 A Yes.

24 Q Now, what are the
25 consequences in the same -- in that example?

26 A That was what I was
27 trying to respond to.

28 Q Right, right.

29 A That would require
30 additional forces obviously in the second winter, that

Dau, Williams, O'Rourke, Harlan
Cross-Exam by Scott

1 would be quite inefficient and as I said, in extreme
2 cases perhaps even more spreads in the second
3 winter.

4 Q I take it theoretically
5 in the worst -- with a major error, it could you force
6 you to a third season? I know that it is a horrible
7 possibility to contemplate, but it -- there is
8 a risk of that if you over estimate, is there not?

9 A There is that risk, it
10 is very minimal, mind you.

11 Q Well, I put it to
12 you that the costs involved in over estimating are
13 much, much greater than the costs in under estimating?

14 A I suspect that is
15 correct.

16 Q Because you are dealing
17 not only with the costs of equipment and so on
18 to catch up or to speed up, but you are dealing with
19 the loss of revenue potentially?

20 A Yes.

21 Q And with interest on
22 capital costs and so on?

23 A That is correct, sir,
24 yes.

25 Q And I take it that
26 therefore it is in the owner's interest to, as
27 you have put it, to be conservative?

28 A Yes.

29 Q That is, if there is
30 any shadow of doubt to under estimate?

Dau, O'Rourke, Williams, Harlan
Cross-Exam by Scott

1 A I think that is correct,
2 sir.

3 Q Well, now I take it that
4 if you should over estimate, one of the -- and you
5 have pinpointed it, one of the remedial measures will
6 be sort of a catch-up period?

7 A That is correct.

8 Q Yes.

9 And I put it to you very
10 frankly that in a catch-up period there are very
11 substantial pressures on the contractor to get the
12 work done almost at all costs?

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Dau, O'Rourke, Williams, Harlan
Cross-Exam by Scott

1 A He would certainly
2 be getting an awful lot of pressure.

3 Q And wouldn't it be fair
4 to say that the humanity of contractors being what it
5 is, that in that situation the environmental protective
6 devices may get a low priority unless there isn't a
7 guardian of the job on the job all the time?

8 A That would be true.

9 Q Yes, and that's why a
10 guardian on the job is so important.

11 A That would be one of the
12 reasons, yes.

13 Q Well, in that situation,
14 here's a problem that occurs to me, in that situation
15 you will have monitors and inspectors.

16 A Yes.

17 Q And their function will
18 be to see to it not only that the pipeline is built
19 with regard to security of the pipe, but see to it
20 that all the environmental conditions and so on that
21 you desire to protect are even in a catch-up situation,
22 honored and respected and built.

23 A That's my understanding,
24 sir.

25 Q Well, isn't one of the
26 troubles going to be that these inspectors and monitors
27 are going to be men working for the owner who is the
28 very person that wants the job caught up and finished?

29 A They certainly will be
30 working for the owner, yes.

Dau, O'Rourke, Williams, Harlan
Cross-Exam by Scott

1 Q Yes, and it will be the
2 owner who will run the risk if the catch-up is not
3 satisfied.

4 A That's correct.

5 Q Well now, may I ask
6 in the in-house debate that went on, what were the
7 factors that were advanced in favor of ten spreads?

8 A Of ten spreads?

9 Q Rather than nine. You
10 just told me, as I understood it, that there was a
11 debate that went on between 8, 9, and 10 spreads.

12 A I'm sorry if I left
13 that impression. I was saying that there was great
14 debate going on about the construction schedules.
15 I am not sure that we had a plan, for instance,
16 that was based on ten spreads.

17 Q Were there any advisors
18 to Northern Engineering Service who favored more than
19 nine spreads in the course of the discussion that
20 led to the ultimate conclusion?

21 A I'm sure there must have
22 been at some time some discussions that favored more
23 than nine spreads. The procedure we used in develop-
24 ing a construction schedule was -- and it's been going
25 on for a long time -- was that Northern developed a
26 plan, several plans, to construct a project. We
27 retained pipeline contractors to provide us with
28 information with respect to the size of crews, quantities
29 of equipment, some cost information, and advice on the
30 amount of work that could be done in a winter

Dau, O'Rourke, Williams, Harlan
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1 season. I think there were eight contractors retained
2 for this assessment. They were given certain sections
3 to assess for us, and I think in all cases more than
4 one section. We got a relatively wide range of opinion
5 with respect to costs. There were obviously different
6 opinions with respect to the size of the crews and
7 the amount of equipment and the amount of fuel that
8 was used and so forth. In doing their assessment
9 they visited the work site, I seem to remember that
10 we arranged summer trips over the sections that were
11 involved, and we also arranged a winter trip. I
12 believe in most instances this was by helicopter. We
13 got all this information and made adjustments in the
14 plan that we had developed, based on the information
15 we got from the contractors. Some of the contractors
16 were more optimistic, some were more pessimistic.
17 The plan we have is a synthesis of the whole program.

18 Q Well, the figure nine
19 looks in substance like kind of a compromise between
20 eight and ten, is that what you're telling me?

21 A No, no.

22 Q Well, what were the
23 concerns that led your contractor advisors who may
24 have done so to opt for more than nine spreads?
25 They may have been wrong, but I'm just wondering what
26 the concerns that motivated them are, insofar as you
27 can judge?

28 A I'm sure some of them
29 did not think that they could construct, say, 80
30 miles of pipeline in the north in one winter season.

Dau, O'Rourke, Williams, Harlan
Cross-Exam by Scott

1 Some of them were under the impression that that's
2 not possible.

3 Q Well, you've agreed with
4 me that you've attempted to be reasonably practical
5 but conservative in selecting the number of spreads.

6 A Yes.

7 Q I take it all these
8 contractors were reputable experienced firms.

9 A Yes sir.

10 Q Yes. Do you think that
11 it's prudently conservative to impose a construction
12 schedule which one of the contracting advisors thinks
13 is inapt or too heavy?

14 A I don't quite understand
15 that.

16 Q Well, let me put it
17 to you this way. You and I, I think, have agreed that
18 the consequences of over-estimating are enormous, and
19 that therefore your motive is to be conservative.

20 A Yes.

21 Q And in order to assist
22 you to devise the number of spreads, you have retained
23 eight or ten contractors who have given you advice.

24 A Yes.

25 Q Now, I would have thought
26 that to be conservative would be to, if you will, take
27 the common denominator of that advice rather than
28 to simply select the advice of a proportion of the
29 contractors.

30 A You're suggesting that

Dau, O'Rourke, Williams, Harlan
Cross-Exam by Scott

1 we go to each contractor and say, "How many do you
2 want?" And add them altogether and divide by nine
3 and use that?

4 Q No, that would not be
5 conservative at all. That would be averaging.

6 A Right.

7 Q I would say that if you
8 had ten contractors and you retained them, unless one
9 of them was way out of the ball park, you would take
10 the worst or the maximum number that your advisors
11 had recommended. It seems to me that would be conser-
12 vative.

13 A I think that's the
14 process we actually used, but I want to make sure you
15 understand that we did not go to the contractors and
16 ask them to assess the overall job. We gave -- they
17 looked at selected areas. In other words, we would
18 select a spread length and ask them to look at that,
19 we selected several spread lengths and asked them to
20 look at that, and at no stage did we ask these
21 advisors to list the number of spreads that were
22 required for the total project. I don't think that
23 was ever done. The information we got from the
24 contractors more related to the equipment that was
25 required, labor that was required, and the advice as
26 to how many miles they could do in a particular winter
27 season.

28 Q And you gave each of
29 them a segment or two to deal with?

30 A As I recall, they all

Dau, O'Rourke, Williams, Harlan
Cross-Exam by Scott

1 got more than one segment to look at.

2 MR. SCOTT: Mr. Commissioner,
3 I'll be asking Mr. Marshall in due course to produce
4 those reports from the advisors.

5 Q Well now, I take it
6 that your scheduling really involves two factors,
7 what you call the productivity factor on the one hand
8 and the non-productive days and analysis or estimate
9 of non-productive days on the other.

10 A Yes.

11 Q Have you assumed a
12 median or a minimum construction season? On your
13 graphs with the little black dashes across them, let
14 us say that you show on one spread a season of 4 1/2
15 months.

16 A Yes.

17 Q Is that an average
18 season, or is that a minimum season?

19 A Sorry, sir. Maybe I can
20 respond this way. In the north the major pipeline
21 installation activities are assumed to take place
22 between December 1st and April 15th in any one year.
23 Any winter season. There are activities, obviously,
24 relating to snow roads and so on, and moving in, that
25 occur before December 1st, and I guess in that sense
26 it's not either a minimum or an average, it's a
27 selected period of time.

28 Q Did this advice again
29 come from your contractors?

30 A I can't recall whether

Dau, O'Rourke, Williams, Harlan
Cross-Exam by Scott

1 it did or it didn't. I believe -- I'm not sure of
2 that, sir.

3 Q Do you know where those
4 assumptions derived?

5 A The assumption of
6 December 1st?

7 Q Yes.

8 A It was from Northern,
9 I'm pretty sure.

DAu, O'Rourke, Williams, Harlan
Cross-Exam by Scott

1 Q Dealing with non-productive
2 days, you say in the evidence at page 4417, volume 34,
3 that non-productive days, that is, the number of
4 days that you deduct from the assumed season, is a
5 judgment number which we think is appropriate. It has
6 been developed as a result of discussions with contractors
7 and our own information.

8 Now, are these reports that
9 the contractors have made to you also going to have
10 a rationalization for that in it?

11 A I am not sure, sir, it
12 is some time since I read those reports.

13 Q What I am getting at is,
14 you know, when you say the season is four and a half
15 months, we will take off one month for non-productive
16 days, it is very difficult to tell whether you are
17 being conservative, radical or median without knowing
18 why you picked one month. Can you help me with that.
19 Why did you pick the number of day that you did?
20 Because an error there, it may be serious.

21 A Selection of the
22 of about a month and a half
23 non-productive days in the north was our best judgment,
24 we provided, as I recall, to the contractors all of
25 the information that we had accumulated over the
26 years on weather and some of the research data that
27 we obtained. I cannot recall that any of them
28 had any violent disagreements with the assumptions
29 that we provided them, but again, I am sorry, I
30 do not have the complete details at my fingertips on
31 that.

1 Q Of course not, but

2 I take it that their reports will reveal where they
3 had them, any views that they had on the ^{number of} non-productive
4 days that you selected.

5 A If they had a view

6 I am sure it is there, sir. Yes.

7 Q Were they asked for

8 their views on that?

9 A I cannot recall, I am

10 sorry, sir.

11 Q Well, now, in addition

12 were they asked for their views on the productivity
13 factor, the other factor that goes into the
14 mix?

15 A I think they were but I

16 am not sure.

17 Q And I take it if they

18 were and if they did give their views that would
19 be contained in those reports as well?

20 A Can I just have one

21 second?

22 Q Yes.

I could

23 A / quickly summarize the

24 information we have provided to the contractors and
25 what we asked for, if you would like, sir.

26 Q I am not troubled about

27 the information that you provided to them. I am
28 concerned about the response that they made to you.

29 Perhaps you can provide, or you can ask Mr. Marshall
30 to provide both to me at a convenient time as you do not

1 obviously have the matter at your fingertips.

2 Would you agree that even
3 for your eight or ten contractors, the judgments
4 that have led to the non-productive days and the
5 productivity factor are bourne out of very little
6 precedent?

7 A Certainly there is
8 no 48" pipeline in permafrost terrain that we can
9 draw our experience on, sir.

10 Q Indeed in Canada there
11 would be no project of this dimension in recent times,
12 would there? Out of which numbers of this value
13 could be obtained.

14 A Not under these circumstances,
15 no, sir.

16 Q Now, as a part time
17 labour lawyer I was astounded to read that in Mr.
18 cross-examination of you you expressed confidence
19 that your schedule would not be significantly effected
20 by strikes. What evidence or studies or material or
21 advice did you have that you were going to get by?

22 A I do not recall saying
23 it that way, sir.

24 Q No, you did not, to
25 be fair.

26 MR. MARSHALL: It was just that
27 Mr. Scott wanted to have a little opportunity to
28 do a little advertising.

29 MR. SCOTT: No, not at all.

30 Q I would have thought, Mr.

DAu, O'Rourke, Williams, Harlan
Cross-Exam by Scott

1 Dau, to be quite serious, that in scheduling any project
2 in North America these days, one of the substantial,
3 unpredictable factors, both in construction and in
4 manufacturing is the possibility of labour unrest and as
5 I understood your answer to Mr. Veale and obviously
6 if that occurred in this project, you, through no
7 fault of your own, perhaps, will have over estimated in
8 the terms in which we have discussed it with the
9 consequences we have described.

10 You expressed confidence
11 to Mr. Veale that that would not happen to you or
12 to Arctic Gas and I just wonder on what that confidence
13 is based.

14 A One of the underlying
15 assumptions in developing the plan and schedule is that
16 there would be an agreement with the labour trades in-
17 volved, a no strike agreement before the project
18 ever started.

19 Q For the life of the
20 project?

21 A Yes, sir.

22 Q So your confidence is
23 predicated on entering into a collective agreement
24 or sub- contractors entering into a collective
25 agreement with all trades that will survive for the
26 life of the contract?

27 A Yes, sir.

28 Q What do you say
29 about --what is your view with respect to labour
30 problems in the manufacturing component of the work?

1 A Are you talking about pipe
2 mills, for instance?

3 Q Pipe mills and other
4 places where essential equipment has to be obtained,
5 that are to a certain extent beyond your power.

6 Have you made any assessment
7 about whether labour unrest may cause delays and
8 therefore effect the schedule there?

9 A No, I have made no
10 assessment, sir.

11 Q Do you know what the
12 experience of the pipeline construction industry is
13 with respect to labour unrest or down time?

14 A Not in specific details,
15 I cannot recall any major problems.

16 Q Do you know anything or
17 have you inquired to determine whether there is
18 anything to know about the experience in Alaska?

19 A I am aware that they
20 have had some problems with one particular union
21 in Alaska recently.

22 Q Is that a construction
23 union or a manufacturing component union? Or do
24 you know?

25 A I believe it was
26 one of the unions that was not a part to the agreement
27 with Alyeska, but I am not positive of that.

28 Q And has that, as far
29 as you understand it, produced a delay in portions of
30 the work?

Dau, O'Rourke, Williams, Harlan
Cross-Exam by Scott

1 A It is my understanding
2 that it has caused some delays, yes.

3 Q Do you know anything of the
4 dimension of that delay?

5 A No, I do not.

6 Q Well, now, I think just
7 two other questions, you will be glad to hear, Mr.
8 Commissioner, I gather from your evidence that
9 you contemplated 12 to 18 month lead time
10 between the last of the regulatory approvals and the
11 start of construction surveys?

12 MR. MARSHALL: I do not recall
13 that being the evidence.

14 MR. SCOTT: It is page two
15 of the canned evidence.

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Cross-Exam by Scott

1 MR. SCOTT: An exigential
2 exercise will have ^{to be} done to get that. But if you
3 read the last of the first paragraph and the assumption
4 of regulatory approvals in the third paragraph, it
5 produces a period, as I understand it, of 12 to 18
6 months.

7 MR. MARSHALL: That talks
8 about a start of pipeline. Your question was about
9 start of surveying, wasn't it, Mr. Scott?

10 MR. SCOTT: Start of con-
11 struction surveys. Is this 12 to 18 months, the
12 actual start of digging; or is it the start of con-
13 struction surveys?

14 A On page 2, sir?

15 Q Yes.

16 A That's the start of
17 the actual pipe-laying, the construction activity.

18 Q All right, and that
19 will be about 12 to 18 months lead time?

20 A No sir, that's not
21 correct.

22 MR. MARSHALL: Mr. Scott, I
23 think there was evidence today that it would be
24 likely, given ^{the} circumstances that you've outlined,
25 that surveying would start the same summer.

26 MR. SCOTT: All right.

27 Q Well, what is the lead
28 time between the last of the regulatory approvals and
29 construction surveying?

30 A I think I said this

Day, O'Rourke, Williams, Harlan
Cross-Exam by Scott

1 morning that -- or yesterday -- that regulatory
2 approvals were obtained in the last -- the end of
3 the first quarter in 1976, that there would be some
4 construction surveys conducted in the summer of 1976.

5 Q How long thereafter does
6 the start of construction occur on that timetable?

7 A Which construction
8 survey, the installation of pipe?

9 Q The first construction
10 work that has to be done. I can perhaps get at
11 this -- do you have the answer now? I can get at
12 this another way.

13 A There would be some
14 construction activity in the summer of '76, and in
15 the winter of '76-'77. The activities would relate
16 to docks and wharves and borrow pits, stockpile
17 sites and things like that.

18 Q Let me put the question
19 another way. I may have dealt with part of it this
20 morning. After regulatory approval, what is the lead
21 time required for final design, in ball park figures?
22 Did you say one year this morning?

23 A Yes, we were talking
24 about the final design for the pipeline. Yes sir.

25 Q What is the lead time
26 after regulatory approval for specifications?

27 A It was the same time
28 frame, sir.

29 Q All right. What is the
30 lead time after regulatory approval for financing and

Dau, O'Rourke, Williams, Harlan
Cross-Exam by Scott

1 contracting the project?

2 MR. MARSHALL: I don't think
3 Mr. Dau can testify about that.

4 MR. SCOTT: All right. Does
5 that have to be done before work starts?

6 A Before major work starts,
7 certainly.

8 Q And you may have dealt
9 with this, or the design panel may have dealt with
10 this. Do you know the lead time required after
11 regulatory approval for the ordering up and delivery
12 of materials?

13 A That depends on the
14 materials, sir.

15 Q Let's take pipe as an
16 example.

17 A It's my understanding
18 with regulatory approval at the end of the first
19 quarter of 1976, it would be possible to start
20 receiving pipe very late in the year 1976.

21 Q Now, on page 3 of the
22 prepared evidence, you say in the third paragraph:

23 "Monthly rates of about 30 miles for winter
24 and 38 miles for summer construction are
25 possible."

26 I'm not quite clear, are those the maximum rates that
27 can be attained?

28 A Yes, in my view the
29 first part of the paragraph says that the plan is
30 based on the contractors having sufficient equipment

1 MR. SCOTT: Could I suggest
2 8:15 in the morning?

3 THE COMMISSIONER: All right,
4 we'll adjourn until 8:15 in the morning, and I know
5 Miss Hutchinson will see if she can get them to turn
6 down the heat or turn on the air-conditioning in this
7 meeting room tomorrow. So 8:15 then.

8 (PROCEEDINGS ADJOURNED TO MAY 16, 1975)
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